

AUGUST 1953

HUGO GERNSBACK, Editor

Science-Fiction *plus*

preview of the future

illustrated feature
**THE END OF
THE MOON**

by
Gustav Albrecht,
Ph.D.
and Frank R. Paul

*Complete
Short Novel*

SPACEBRED GENERATIONS

By Clifford D. Simak



HANDS ACROSS SPACE

By Chad Oliver



Other Science-Fiction



SCIENCE-FICTION SEMANTICS

... New words and definitions for S-F ...

BY HUGO GERNSBACH

SCIENCE-FICTION ever since its beginning, has spoken a language all its own. As it grows, its literature keeps step with its growth—new terminology, new words, new meanings being added constantly.

Recently we were asked to supply a typical sample of science-fictionese by the "Time Capsule" radio program. This was to be placed into an actual time-capsule, in the Museum of Natural History, and held there until March 2053. The sample reads as follows:

The space ship's visi-screen flashed a warning glow. "Contraterrane matter indicated," the astrogator's voice boomed urgently. "Force-field's going up. Now switching to -space-drive and setting trajectory to skirt periphery of Venus' orbit and intersect it at perihelion. Gravitor plates go off when in Venus' gravity field. Crew prepare for free-fall. Man all disintegrators on entering atmosphere. Androids to reconnoiter if planet is damp, robots if dry. Tune their positronic impulses to record on the electronic brain. Keep a sharp look-out for bug-eyed monsters." The visi-screen's glow faded and the voice died.

As new situations develop in science-fiction, as science progresses, new terms must be coined. Thus in 1911 the writer probably was the first to use the words space-flyer, space flying, space sickness, anti-gravitator, and many other words in common use today. Although the vocabulary of modern science-fiction is rich today, it is nothing compared with what it will become during the next 25 years.

It is also true that science-fiction authors and scientists launch terms that never should have been used. As an example, one might cite a recent addition: *space-medicine*. To us, this is an unfortunate term, because medicine implies the curing or mitigation of disease. *Space-medicine* is constantly being used to investigate man's reactions to free fall and other phenomena, which have nothing to do with disease *per se*. In our opinion, the correct term is: *space-biology*.

Recently, in the first issue of SCIENCE-FICTION +, we coined a new word, *spatialogy* (the science of space), for want of a better term. Admittedly, the term is not wholly satisfactory, but until a better one appears, we will continue using it.

For nearly a generation, science-fiction authors and even scientists have misused the common word *year*—a term purely for terrestrial purposes. Then we are transported to Mars, Venus, Neptune, and to planets of other galaxies, and still the authors use the word "year" there! Yet the Mercury "year" has but 88 Earth days, the Venus "year" has only 224 terrestrial days, the Martian "year" is almost two of our years long, the Neptunian "year" runs 165 of our years.

Clearly, logic dictates that the word *year* should be used *only* on Earth, never on another planet. For what is a year? The *time* the Earth takes to make a complete revolution in its orbit around the sun.

Therefore, we advance the new term *orbitemp*—orbit + temp (time)—plural: *orbitemps* or *orbitempis*. This means what it says: an *orbitemp* is the time it takes a planet to make a complete revolution around its primary, be it a given planet around its sun or a satellite around its planet.

Thus a Martian *orbitemp* is one time unit, while a Pluto *orbitemp* is an entirely different one. In communicating with an alien race, we would say that planet 1 (Mercury, closest to the sun) has 1 *orbitemp*, planet 2 (Venus) has 2.5, planet 3 (Earth) has 4.16 *orbitemps*, while planet 8 (Neptune) has 683 *orbitemps*, etc.

The wholly arbitrary *mundane* light *year* based on the distance light takes to travel in 365 Earth days should be changed to a logical astronomical norm, the *light unit*. Thus it takes 4 light years for light to travel between our sun and Alpha Centauri, our nearest star. Using the new intergalactic yardstick, we would then say it takes one *light unit* to reach Alpha Centauri from our solar system. As the speed of light is constant, anywhere, an astronomer in any part of our (or another) galaxy could easily check the distance between the two stars: sun and Alpha Centauri, once we describe the intergalactic yardstick, either by radio or other forms of communication.

Authors still continue to use purely *mundane* terms on distant planets. Thus their characters shovel *earth* on Mars and they glibly speak of *subterranean* caves on Venus or elsewhere!—blunders that frequently get by even astute editors. Here, of course, the words *soil* and *substrata* or similar substitutes should be used.

We know today that once man reaches outer space—beyond the confines of our atmosphere—the greatest dangers to him will be solar and cosmic radiations. But so far we have no popular unit names for such radiations. True, we have Angströms for ultra violet and Röntgens for solar X-rays, but these terms are too technical for quick understanding.

If we said that in outer space one "*solex*" would kill a man in a rubber spacesuit, this would help to define the X-ray danger. Likewise, one "*ulvio*" (ultraviolet radiation) would kill you in one minute, while the same was true of one "*cosrar*" (cosmic radiation).

If these or similar terms were adopted now, it would pave the way for better popular understanding of the dangers of outer space, which man will visit very soon.

Science-Fiction^{plus}

preview of the future

AUGUST, 1953

Vol. I, No. 5

complete short novel

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PHILIP JOSÉ FARMER

author of the sensational novel, *The Lovers*, returns to the pages of *Science-Fiction+* with a short novel jammed with the strong writing, unique ideas, and human elements that have made him a new favorite. This story will be complete with six illustrations by VIRGIL FINLAY!

JACK WILLIAMSON

famed science-fiction veteran presents a short story with some provoking new thoughts on the subject of gravitation.

NOTE: This is the AUGUST issue of *SCIENCE-FICTION+* (No JULY issue was published). The next issue will be on sale August 12th.

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will be paid by this magazine for each Short-Short Science-Fiction Story. These stories must be real science-fiction, not fantasy, and should not run over 1,000 words. The Short-Short + will occupy one full page.



This design, symbolizing science-fiction, is displayed with all stories of a serious scientific-technical trend. Such stories contain new scientific ideas which are certain to be realized in the future.

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"That's the one we headed for a thousand years ago."

by CLIFFORD D. SIMAK

Space bred

Here at last is a different science-fiction story. Imagine a space ark launched from the Earth seeking another star system. The space ark is in transit for over 1,000 years, during which time the several thousand occupants are permanently imprisoned. What will be the sociological and other effects on these travelers? How will they live? What are the implications of time and isolation on their behavior, their lives, their thoughts, and their beliefs? Clifford D. Simak has painted a most daring yet logical picture of this situation. It is one of those rare stories that will start you thinking, and that you will remember.

THERE had been silence—for many generations. Then the silence ended.

The Mutter came at "dawn."

The Folk awoke, crouching in their beds, listening to the Mutter. It had been spoken that one day would come the Mutter?

And that the Mutter would be the beginning of the End?

Jon Hoff awoke, and Mary Hoff, his wife.

They were the only two within their cubicle, for they had no children. They were not yet allowed a child. Before they could have a child the elderly Joshua must die before there would be room for it, and knowing this they had waited for his death, guilty at their unspoken prayer that he soon must die—willing him to die so they might have a child.

The Mutter came and ran throughout the Ship. Then the bed in which Jon and Mary crouched spun upward from the floor and crashed against the wall, pinning them against the humming metal, while all the other furniture—chest and chairs and table—came crashing from floor to wall, where it came to rest, as if the wall suddenly had become the floor and the floor the wall.

The Holy Picture dangled from the ceiling, which a moment before had been the other wall, hung there for a moment, swaying in the air; then it, too, crashed downward.

In that moment the Mutter ended and there was silence once again—but not the olden silence, for although there was no sound one could reach out and pinpoint, there were many sounds—a feeling, if not a hearing, of the sounds of surging power, of old machinery stirring back to life, of an old order, long dormant, taking over once again.

Jon Hoff crawled out part way from beneath the bed, then straightened on his arms, using his back to lift the bed so his wife could crawl out, too. Free of the bed, they stood on the wall—that-had-become-a-floor and saw the litter of the furniture, which had not been theirs alone, but had been used and then passed down to them through many generations.

For there was nothing wasted; there was nothing thrown away. That was the law—or one of many laws—that you could not waste, that you could not throw away. You used everything there was, down to the last shred of its utility. You ate only enough food—nor more, no less. You drank only enough water—no more, no less. You used the same air over and over again—literally the same air. The wastes of your body went into the converter to be changed into something that you, or someone else, would use again. Even the dead—you used the dead again. And there had been many dead in the long generations from the First Beginning. In months to come, some day perhaps not too

(Illustrations by Tom O'Reilly)

Although writing is but his avocation, Clifford D. Simak has had three books published, *City*, *Cosmic Engineers*, and *Ring Around the Sun*, supplemented by a dozen or more anthology inclusions.



Generations

distant now, Joshua would be added to the dead, would give over his body to the converter for the benefit of his fellow-folk, would return, finally and irrevocably, the last of all that he had taken from the community, would pay the last debt of all his debts—and would give Jon and Mary the right to have a child.

For there must be a child, thought Jon, standing there amidst the wreckage—there must be a child to whom he could pass on the Letter and the Reading.

There was a law about the Reading, too. You did not read because reading was an evil art that came from the Beginning and the Folk had, in the Great Awakening, back in the dimness of Far Past, ferreted out this evil among many other evils and had said it must not be.

So it was an evil thing that he must pass on, an evil art, and yet there was the charge and pledge—the charge his long-dead father had put upon him, the pledge that he had made. And something else as well: The nagging feeling that the law was wrong.

However, the laws were never wrong. There was a reason for them all. A reason for the way they lived and for the Ship and how the Ship had come to be and for those who peopled it.

Although, come to think of it, he might not pass the Letter on. He might be the one who would open it, for it said on the outside of the envelope that it was to be opened in emergency. And this, Jon Hoff told himself, might be emergency—when the silence had been broken by the Mutter and the floor became a wall and the wall a floor.

Now there were voices from the other cubicles, frightened voices that cried out and other voices that shrieked with terror, and the thin, high crying of the children.

"Jon," said Mary Hoff, "that was the Mutter. The End will be coming now."

"We do not know," said Jon. "We shall have to wait and see. We do not know the End."

"They say . . ." said Mary, and Jon thought that was the way it always was.

They say. They say. They say.

It was spoken; it was not read nor written.

And he heard his dead father speaking once again, the memory of how he had spoken long ago.

"The brain and the memory will play you false, for the memory will forget a thing and twist it. But the written word will stay forever as it was written down. It does not forget and does not change its meaning. You can depend upon the written word."

"They say," said Mary, "that the End will come swiftly when we hear the Mutter. That the stars will no longer move, but will stand still in the blackness and that is a sure sign the End is near at hand."

And, he wondered, the end of what? The end of us? The end of the Ship? The end of the stars themselves? Or, perhaps, the end of everything, of the Ship and stars and the great blackness in which the stars were spinning.

He shuddered to think of the end of the Folk or of the Ship, not so much that the Ship should end or that the Folk should end, but that the beautiful, efficient, well-balanced order in which they lived should end. For it was a marvelous thing that every function should be so ordered that there always would be enough for the Folk to live on, with never any surplus. No surplus of food or water or air, or of the Folk themselves, for you could not have a child until someone assigned against the coming of that child should die.

There were footsteps running in the corridors outside the cubicles and excited shouting, and suddenly there was someone pounding on the door.

"Jon! Jon!" the voice shouted. "The stars are standing still!"

"I knew it!" Mary cried. "I told you, Jon. It is as it was spoken."

Pounding on the door!

And the door was where it should have been, where a door logically should be, where you could walk straight out of it to the corridor, instead of climbing the now-useless ladder that ran ridiculously to it from the wall-that-used-to-be-the-floor.

Why didn't I think of that before? he asked himself. Why didn't I see that it was poor planning to climb to a door that opened in the ceiling?

Maybe, he thought—maybe this is the way it should have been all the time. Maybe the way it had been before was wrong. As the laws might well be wrong.

"I'm coming, Joe," said Jon's voice.

He strode to the door and opened it and he saw that what had been the wall of the corridor was now the floor and that many doors were opening into it directly from the cubicles and that folks were running up and down the corridor and he thought: We can take down the ladders now, since we have no use for them. We can feed them into the converter and that will give us the margin that we never have.

Joe gripped him by the arm.

"Come with me," he said.

They went to one of the topsy-turvy observation blisters. The stars were standing still.

Exactly as it had been spoken, the stars were still.



"The stars were standing still."

It was a frightening thing, for now you could see that the stars were not simply spinning lights that seemed to move against the flatness of a dead-black curtain, but that they were hanging in an emptiness that took the pit out of your stomach and made you gasp and clutch the metal of the ports, fighting to keep your balance, fighting off the lightheadedness that came upon you as you stared into a gulf you could not understand.

THERE were no games that "day," there were no hikes, there was no revelry in the amusement lounge.

There were knots of frightened people talking. There was praying in the chapel where hung the largest of the Holy Pictures, showing the Tree and the Flowers and the River and the House far off, with a sky that had Clouds in it and a Wind you could not see, but only knew was there. There was a picking up and a straightening up of the cubicles in preparation for a "night" of sleeping and a rehanging once again of the Holy Pictures that were the prized possession of each cubicle. There was a taking down of ladders.

Mary Hoff rescued the Holy Picture from the debris on the floor and Jon stood one of the chairs against the wall and hung it upon the wall-that-once-had-been-the-floor and wondered how it happened that each of the Holy Pictures was a little different from all the others of them. And it was the first time he had ever wondered that.

The Hoff's Holy Picture had a Tree in it, too, and there were Sheep beneath the Tree and a Fence and Brook, and in the corner of the picture there were some tiny Flowers, and, of course, the Grass that ran up to the Sky.

After he had hung the picture and Mary had gone off to another cubicle to talk in horror-stricken, old-wife fashion with some of the other women, Jon went down the corridor, strolling as casually as he could so no one would notice him, so that no one would mark any hurry in him.

But there was hurry in him—a sudden, terrible hurry that tried to push him on like two hands against his back.

He tried to look as if he were doing nothing more than genteelly killing time. It was easy for him, for that was all he'd done his entire life, all that any of them had ever done. Except the few, the lucky or unlucky ones, whichever way you might look at it, who had the hereditary jobs—tending the hydroponic gardens¹ or the cattle pens or the poultry flocks.

But the most of them, thought Jon, loitering his way along, had done no more than grow expert in the art of killing time. Like he and Joe, with their endless chess games and the careful records that they kept of every move they made, of every move and game. And the hours they spent in analyzing their play from the records that they made, carefully annotating each decisive move. And why not, he asked himself—why

not record and annotate the games? What else was there to do? What else?

There were no people now in the corridor and it had grown dimmer, for now there were only occasional light bulbs to drive back the darkness. Years of bull-snatching to keep the living cubicles supplied had nearly stripped the Ship.

He came to an observation blister and ducked into it, crouching just inside of it, waiting patiently and watching back along his trail. He waited for the one who might have followed him and he knew there would be no one, but there *might* be someone and he couldn't take the chance.

No one came, and he went on again, coming to the broken-down escalator which went to the central levels, and here, once again, there was something different. Always before, as he had climbed level after level, he had steadily lost weight, lost the pull against his feet, had swam rather than walked toward the center of the Ship. But this time there was no loss of weight, this time there was no swimming. He trudged broken escalator after broken escalator for all the sixteen decks.

He went in darkness now, for here the bulbs were entirely gone, snatched or burned out over many years. He felt his way upward, with his hand along the guide-rails, feeling the cross-draft of the corridors that plunged down the great Ship's length.

He came at last to the proper level and felt his way along until he came to the hiding place, a dispensary room with a pharmaceutical locker against one wall.

He found the proper drawer and pulled it open and his hand went in and found the three things that he knew were there—the Letter, Book, and a bulb.

He ran his hand along the wall until he found the outlet and when he found it inserted the bulb and there was light in the tiny room, light upon the dust that lay across the floor and along the counter tops, light upon the wash basin and the sink, the empty cabinets with their idly open doors.

He laid the Letter face up beneath the light and read the words that were printed in block letters:

TO BE OPENED ONLY IN EMERGENCY.

He stood there for a long time, considering.

There had been the Mutter.

The stars were standing still.

Emergency, he thought. This is emergency.

For had it not been spoken that when the Mutter came and the stars stood still the End was near at hand?

And if the End were near at hand, then it was emergency.

He lifted the Letter in his hand and held it, hesitating. When he opened it, that would be the end of it. There would be no more handing down—no more of the Letter and the Reading. For this was the moment toward which the Letter had traveled down through time, from father to son for many generations.

Slowly he turned the Letter over and ran a thumb-nail along the sealed edge and the dry wax cracked open and the flap sprang loose.

He reached in and took the message out and spread it flat upon the counter top underneath the lamp. He read, his lips moving to form whispered words, reading as one must read who had spelled out the slow meaning of his words from an ancient dictionary:

To the son of my son many times removed:

They will have told you and by this time you may well believe that the ship is a way of life, that it started in a myth and moves toward a legend and that there is no meaning to be sought within its actuality and no purpose.

¹ Hydroponics is the art of growing plants in water with added chemical nutrients instead of soil. The feasibility of hydroponics has been well demonstrated in many experiments, but so far has not proved in any case I know of to be economically successful. Chemically necessary to plant growth are carbon, oxygen, hydrogen, nitrogen, potassium, calcium, magnesium, sulphur, phosphorus, and iron. Small quantities of boron, zinc, manganese and copper also are required. Molybdenum is necessary in extremely minute quantities. On board a spaceship, hydroponics would be an ideal way to produce food, with the added advantage that the plant growth would aid in atmospheric engineering by absorbing carbon dioxide and releasing oxygen. In hydroponics aboard a spaceship there would be no seasons; crops would be growing all the time. Although some insect pests might exist, to start with, these probably would be eradicated after a human generation or less, so that the crops would be pest-free. The same situation would exist so far as plant disease is concerned. Once either pests or disease were eliminated within a spaceship there would be no further danger, since re-infection from other crop areas could not occur. Since there would be on board a spaceship nothing equivalent to sunlight, necessary for the growth of plants, the deficiency would have to be supplied by the use of lamps.—The Author.

It would be fruitless for me to try to tell you the meaning or the purpose of the ship, for while these words are true, by themselves they will have little weight against the perversion of the truth which by the time you read this may have reached the stature of religion.

But there is purpose in the ship, although even now, as this is written, the purpose has been lost, and as the ship plunges on its way it will remain not only lost, but buried beneath the weight of human rationalizing.

In the day that this is read there will be explanations of the ship and the people in it, but there will be no knowledge in the explanations.

To bring the ship to its destination there must be knowledge. There is a way that knowledge may be gained. I, who will be dead, whose body will have gone back into a plant long eaten, a piece of cloth long worn out, a molecule of oxygen, a pinch of fertilizer, have preserved that knowledge for you. On the second sheet of this letter are the directions for the acquiring of that knowledge.

I charge you to acquire that knowledge and to use it that the minds and lives which launched the ship and the others who kept it going and those who even now reside within its walls, may not have used themselves, nor dedicated themselves, in vain, that the dream of Man may not die somewhere far among the stars.

You will have learned by the time you read this, even to a greater degree than I know it today, that nothing must be wasted, nothing must be thrown away, that all resources must be guarded and husbanded against a future need.

And that the ship not reach its destination, that it not serve its purpose, would be a waste so great as to stun the imagination. It would be a terrible waste of thousands of lives, the waste of knowledge and of hope.

You will not know my name, for my name by the time you read this will be gone with the hand that drives the pen, but my words will still live on and the knowledge in them and the charge.

I sign myself, your ancestor,
And there was a scrawl that Jon could not make out.

He let the Letter drop to the dust-laden counter top and words from the Letter hammered in his brain.

A ship that started in a myth and moved toward a legend.

But that was wrong, the Letter said.
There was a purpose and there was a destination.
A destination? What was that?
The Book, he thought—the Book will tell what destination is.

With shaking hands he hauled the Book out of the drawer and opened it to D and followed down the columns with an unsteady finger, desquamative, dessert, destinate, destination—

Destination (n)—The place set for the end of a journey, or to which something is sent; a place or point aimed at.

The Ship had a destination.
The Ship was going somewhere.
The day would come when it would reach the place that it was going.

And that would be the end, of course.
The Ship was going somewhere.
But how? Did the Ship move?

He shook his head in disbelief. That the Ship moved was unbelievable. It was the stars, not the Ship, that moved.

There must be, he felt certain, another explanation.

He picked up the Letter's second sheet and read it through, but didn't understand it all, for his brain was tired and befuddled. He put the Letter and the Book and bulb back in the drawer.

He closed the drawer and fled.

THEY had not noticed his absence in the lower level and he moved among them, trying to be one of them again, trying to pick up the old cloak of familiarity and wrap it around his sudden nakedness—but he was not one of them.

A terrible knowledge had made him not one of them. The knowledge that the Ship had a purpose and a destination—that it had started somewhere and was going somewhere and that when it got where it was going that would be the End, not of the Folk, nor of the Ship, but only of the Journey.

He went into the lounge and stood for a moment just inside the doorway. Joe was playing chess with Pete and a swift anger flared within him at the thought that Joe would play with someone else, for Joe had not played chess with anyone but him for many, many years. But the anger dropped quickly from him and he looked at the chessmen for the first time, really saw them for the first time, and he saw that they were idle hunks of carved wood and that they had no part in this new world of the Letter and the Purpose.

George was sitting by himself playing solitaire and some of the others were playing poker with the metal counters they called "money," although why they called it money was more than anyone could tell. It was just a name, they said, like the Ship was the name for the ship and the Stars were what the stars were called. Louise and Irma were sitting in one corner listening to an old, almost worn-out recording of a song and the shrill, pinched voice of the woman who sang screeched across the room:

*"My love has gone to the stars,
"He will be away for long..."*

Jon walked into the room and George looked up from the cards. "We've been looking for you."

"We've been looking for you."

"I went for a walk," said Jon. "A long walk. On the center levels. It's all wrong up there. It's up, not in. You climb all the way."

"The stars have not moved all day," said George.

Joe turned his head and said, "The stars won't move again. This is as it was spoken. This is the beginning of the End."

"What is the End?" asked Jon.

"I don't know," said Joe and went back to his game.

The End, Jon thought. And none of them knew what the End will be, just as they do not know what a ship is, or what money is, or the stars.

"We are meeting," said George. Jon nodded.

He should have known that they would meet. They'd meet for comfort and security. They'd tell the Story once again and they'd pray before the Picture. And I, he thought, and I?

He swung from the room and went out into the corridor, thinking that it might have been best if there'd been no Letter and no Book, for then he'd still be one of them and not a naked stranger standing by himself—not a man torn with wondering which was right, the Story or the Letter.

He found his cubicle and went into it. Mary was there, stretched out on the bed, with the pillows piled beneath her head and the dim bulb burning. "There you are," she said.

"I went for a walk," said Jon.

"You missed the meal," said Mary. "Here it is."

He saw it on the table and went there, drawing up a chair. "Thanks," he said.

She yawned. "It was a tiring day," she said. "Everyone was so excited. They are meeting."

There was the protein yeast, the spinach and the peas, a thick slice of bread and a bowl of soup, tasty with mushrooms and herbs. And the water bottle, with the carefully measured liquid.

He bent above the soup bowl, spooning the food into his mouth.

"You aren't excited, dear. Not like the rest."

He lifted his head and looked at her. Suddenly he wondered if he might not tell her, but thrust the thought swiftly to one side, suddenly afraid that in his longing for human understanding he finally would tell her. He must watch himself, he thought.

For the telling of it would be proclaimed heresy, the denying of the Story, of the Myth and Legend. And once she had heard it, she like any of the others, would shrink from him and he'd see the loathing in her eyes.

With himself, it was different, for he had lived on the fringe of heresy for almost all his life, ever since that day his father had talked to him and told him of the Book. For the Book itself was a part of heresy.

"I have been thinking," he said, and she asked, "What is there to think about?"

And what she said was true, of course. There was nothing to think about. It was all explained, all neat and orderly. The Story told of the Beginning and the beginning of the End. And there was nothing, absolutely nothing for one to think about.

There had been Chaos and out of the Chaos order had been born in the shape of the Ship and outside the Ship there was Chaos still. It was only within the Ship that there was order and efficiency and law—or the many laws, the waste not, want not law and all the other laws. There would be an End, but the End was something that was still a mystery, although there still was hope, for with the Ship had been born the Holy Pictures and these, in themselves, were a symbol of that hope, for within the picture were the symbolism-values of other ordered places (bigger ships, perhaps) and all of these symbol-values had come equipped with names, with Tree and Book and Sky and Clouds and other things one could not see, but knew were there, like the Wind and Sunshine.

The Beginning had been long ago, so many generations back that the stories and the tales and folklore of the mighty men and women of those long-gone ages pinched out with other shadowy men and women still misty in the background.

"I was scared at first," said Mary, "but I am scared no longer. This is the way that it was spoken and there is nothing we can do except to know it is for the best."

He went on eating, listening to the sound of passing feet, to the sound of voices going past the door. Now there was no hurry in the feet, no terror in the voices. It hadn't taken long, he thought, for the Folk to settle down. Their Ship had been turned topsy-turvy, but it still was for the best.

And he wondered if they might not be the ones who were right, after all—and the Letter wrong.

He would have liked to have stepped to the door

and hailed some of those who were passing by so he could talk with them, but there was no one in the ship (not even Mary) he could talk to.

Unless it were Joshua.

He sat eating, thinking of Joshua in the ponie gardens, pottering around, fussing with his plants.

As a boy, he'd gone there, along with the other boys, Joe and George and Herb and all the rest of them. Joshua then had been a man of middle age who always had a story and some sage advice and a smuggled tomato or a radish

for a hungry boy. He had, Jon remembered, a soft gentle way of talking and his eyes were honest eyes and there was a gruff, but winning friendliness about him.

It had been a long time, he realized, since he'd seen Joshua. Guilt, perhaps, he told himself.

But Joshua would be one who could understand the guilt. For once before he had understood.

It had been he and Joe, Jon remembered, who had sneaked in and stolen the tomatoes and been caught and lectured by the gardener. Joe and he had been friends ever since they had been toddlers. They had always been together. When there was devilment afoot the two of them were sure, somehow, to be in the middle of it.

Maybe Joe . . .

Jon shook his head. Not Joe, he thought. Even if he were his best friend, even if they had been pals as boys, even if they had stood up for another when they had been married, even if they had been chess partners for more than 20 years—even so, Joe was not one he could tell about this thing.

"You still are thinking, dear," said Mary.

"I'll quit," said Jon. "Tell me about your day." She told him. What Louise had said. And what Jane had said. And how foolish Molly was. The wild rumor and the terror and the slow quieting of the terror with the realization that, whatever came, it was for the best.

"Our Belief," she said, "is a comfort, Jon, at a time like this."

"Yes," said Jon. "A great comfort, indeed."

She got up from the bed.

"I'm going down to see Louise," she said. "You'll stay here?" She bent and kissed him.

"I'll walk around until meeting time," he said.

He finished his meal, drank the water slowly, savoring each drop, then went out.

HE headed for the hydroponic gardens. Joshua was there, a little older, his hair a little whiter, his shuffle more pronounced, but with the same kind crinkle about his eyes, the same slow smile upon his face.

And his greeting was the joke of old: "You come to steal tomatoes?"

"Not this time," said Jon.

"You and the other one."

"His name is Joe."

"I remember now. Sometimes I forget. I am getting older and sometimes I forget." His smile was quiet. "I won't take too long, lad. I won't make you and Mary wait."

"That's not so important now," said Jon.

"I was afraid that after what had happened you would not come to see me."



"It is the law," said Jon. "You and I, nor Mary, had anything to do with it. The law is right. We cannot change the law."

Joshua put out a hand and laid it on Jon's arm.

"Look at the new tomatoes," he said. "They're the best I've ever grown. Just ready to be picked."

He picked one, the ripest and the reddest, and handed it to Jon.

Jon rubbed the bright fruit between his hands, feeling the smooth, warm texture of it, feeling the juice of it flow beneath the skin.

"They taste better right off the vine. Go ahead and eat it."

Jon lifted it to his mouth and set his teeth into it and caught the taste of it, the freshly-picked taste, felt the soft pulp sliding down his throat.

"You were saying something, lad."

Jon shook his head.

"You have not been to see me since it happened," said Joshua. "The guilt of knowing I must die before you have a child kept you away from me. It's a hard thing, I grant—harder for you than it is for me. You would not have come except for a matter of importance."

Jon did not answer.

"Tonight," said Joshua, "you remembered you could talk to me. You used to come and talk with me often, because you remembered the talk you had with me when you were a kid."

"I broke the law," said Jon. "I came to steal tomatoes. Joe and I and you caught us . . ."

"I broke the law just now," said Joshua. "I gave you a tomato. It was not mine to give. It was not yours to take."

"But I broke the law because the law is nothing more than reason and the giving of one tomato does not harm the reason. There must be reason behind each law or there is no occasion for the law. If there is no reason, then the law is wrong."

"But to break a law is wrong . . ."

"Listen," said Joshua. "You remember this morning?"

"Of course I do."

"Look at those tracks—the metal tracks, set deep into the metal, running up the wall."

Jon looked and saw them.

"That wall," said Joshua, "was the floor until this morning."

"But the tanks! They . . ."

"Exactly," said Joshua. "That's exactly what I thought. That's the first thing I thought when I was thrown out of bed. My tanks, I thought. All my beautiful tanks. Hanging up there on the wall. Fastened to the floor and hanging on the wall. With the water spilling out of them. With the plants dumped out of them. With the chemicals all wasted. But it didn't happen that way."

He reached out and tapped Jon on the chest.

"It didn't happen that way—not because of a certain law, but because of a certain reason. Look at the floor beneath your feet."

Jon looked down and the tracks were there, a continuation of the tracks that ran up the wall.

"The tanks are anchored to those tracks," said Joshua. "There are wheels enclosed within those tracks. When the floor changed to the wall, the tanks ran down the tracks and up the wall that became the floor and everything was all right. There was a little water spilled and some plants were damaged, but not any of them."

"It was planned," said Jon. "The Ship . . ."

"There must be reason to justify each law," Joshua

told him. "There was reason here and a law as well. But the law was only a reminder not to violate the reason. If there were only reason you might forget it, or you might defy it or you might say that it had become outdated. But the law supplies authority and you follow law where you might not follow reason."

"The law said that the tracks on the wall, the old wall, that is, must be kept clear of obstacles and must be lubricated. At times we wondered why, for it seemed a useless law. But because it was a law we followed it quite blindly and so when the Mutter came the tracks were clear and oiled and the tanks ran up them. There was nothing in the way of their doing so, as there might have been if we'd not followed law. For by following the law, we also followed the reason and it's the reason and not the law that counts."

"You're trying to tell me something," Jon said.

"I'm trying to tell you that we must follow each law blindly until we know the reason for it. And when we know, if we ever know, the reason and the purpose, we must then be able to judge whether the reason or the purpose is a worthy one. We must have the courage to say that it is bad, if it is bad. For if the reason is bad, then the law itself is bad, for a law is no more than a rule designed for a certain reason or to carry out a purpose."

"Purpose?"

"Certainly, lad, the purpose. For there must be some purpose. Nothing so well planned as the Ship could be without a purpose."

"The Ship itself? You think the Ship has Purpose? They say . . ."

"I know what they say. Everything that happens must be for the best."

He wagged his head.

"There must have been a purpose, even for the Ship. Sometime, long ago, that purpose must have been plain and clear. But we've forgotten it. There must be certain facts and knowledge . . ."

"There was knowledge in the books," said Jon.

"But they burned the books."

"There were certain untruths in them," said the old man. "Or what appeared to be untruths. But you cannot judge the truth until you have the facts and I doubt they had the facts. There were other reasons, other factors . . ."

"I'm a lonely man. I have a job to do and not many come to visit. I have not had gossip to distract me, although the Ship is full of gossip. I have thought. I have done a lot of thinking. I thought about us and the Ship. I thought about the laws and the purpose of it all."

"I have wondered what makes a plant grow, why water and chemicals are necessary to their growth. I have wondered why we must turn on the lamps for just so many hours—what is there in the lamps that helps a plant to grow? But if you forget to turn them on, the plant will start to die, so I know the lamps are needed, that the plants need not water and chemicals alone, but the lamps as well."

"I have wondered why a tomato always grows on a tomato vine and why a cucumber always grows on a cucumber vine. You never find a tomato on a cucumber vine and there must be a reason."

"Behind even so simple a thing as the growing of tomatoes there must be a mass of reasons, certain basic facts. And we do not know these facts. We do not have the knowledge."

"I have wondered what it is that makes the lamps light up when you throw the switch."

"I have wondered what our bodies do with food. How does your body use that tomato you've just eaten? Why must we eat to live? Why must we sleep? How did we learn to talk?"

"I have never thought of all that," said Jon.

"You have never thought at all," said Joshua, "or almost not at all."

"No one does," said Jon.

"That is the trouble with the Ship," the old man told him. "No one ever thinks. They while away their time. They never dig for reasons. They never even wonder. Whatever happens must be for the best and that's enough for them."

"I have just begun to think," said Jon.

"There was something you wanted," said the old man. "Some reason that you came."

"It doesn't matter now," said Jon. "You have answered it."

He went back, through the alleyways between the tanks, smelling the scent of green things growing, listening to the gurgle of the water running through the pumps. Back up the long corridors, with the stars shining true and steady now through the ports in the observation blisters.

Reason, Joshua had said. There is reason and a purpose. And that had been what the Letter had said, too—reason and a purpose. And as well as truths there will be untruths and one must have certain knowledge to judge a thing, to say if it is true or not.

He squared his shoulders and went on.

THE meeting was well under way when he reached the chapel and he slid in quietly through the door and found Mary there. He stood beside her and she slipped her hand in his and smiled.

"You are late," she whispered.

"Sorry," he whispered back, and then they stood there, side by side, holding hands, watching the flicker of the two great candles that flanked the massive Holy Picture.

Jon thought that never before had he seen it to such a good advantage nor seen it quite so well and he knew that it was a great occasion when they burned the candles for it.

He identified the men who sat below the Picture—Joe, his friend, and Greg and Frank. And he was proud that Joe, his friend, should be one of the three who sat beneath the Picture, for you must be pious and a leader to sit beneath the Picture.

They had finished reciting the Beginning and now Joe got up and began to lead them in the Ending.

"We go toward an End. There will be certain signs that shall foretell the coming of the End, but of the End itself no one may know, for it is unrevealed..."

Jon felt Mary's hand tighten upon his and he returned the pressure and in the press of hand to hand he felt the comfort of a wife and of Belief and the security of the brotherhood of all the Folk.

It was a comfort, Mary had said while he had eaten the meal she had saved for him. There is comfort in our Belief, she'd said. And what she had said was true. There was comfort in Belief, comfort in knowing that it all was planned, that it was for the best, that even in the End it would be for the best.

They needed comfort,

he thought. They needed comfort more than anything. They were so alone, especially so alone since the stars had stopped their spinning and stood still, since you could stand at a port and look out into the emptiness that lay between the stars.

Made more alone by the lack of purpose, by the lack of knowing, although it was a comfort to know that all was for the best.

"The Mutter will come and the stars will stop their spin and they will stand naked and alone and bright in the depth of darkness, of the eternal darkness that covers everything except the Folk within the Ship..."

And that was it, thought Jon. The special dispensation that gave them the comfort. The special knowing that they, of all the things there were, were sheltered and protected from eternal night. Although, he wondered, how did the special knowing come about? From what source of knowledge did it spring? From what revelation?

And blamed himself for thinking as he did, for it was not meet that he should think such things at meeting in the chapel.

He was like Joshua, he told himself. He questioned everything. He wondered about the things that he had accepted all his life, that had been accepted without question for all the generations.

He lifted his head and looked at the Holy Picture—at the Tree and Flowers and the River and the House far off, with the Sky that had Clouds in it and Wind you could not see, but knew was there.

It was a pretty thing—it was beautiful. There were colors in it he had never seen anywhere except in the Pictures. Was there a place like that, he wondered, or was it only symbolism, only an idealization of the finest that was in the Folk, a distillation of the dreams of those shut up within the Ship...

Shut up in the Ship! He gasped that he had thought it. Shut up! Not shut up. Protected, rather. Protected and sheltered and kept from harm, set apart from all else which lay in the shadow of eternal night.

He bent his head in prayer, a prayer of contriteness and self-accusation. That he should think a thing like that!

He felt Mary's hand in his and thought of the child that they would have when Joshua was dead. He thought of the chess games he had played with Joe. He thought of the long nights in the darkness with Mary at his side.

He thought of his father, and the long-dead words thundered in his brain. And the Letter that spoke of knowledge and of destination and had a word of purpose.

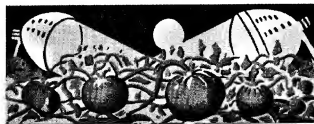
What am I to do? he asked himself. Which road am I to follow? What is the Meaning and the End?

HE COUNTED doors and found the right one and went in.

The place was thick with dust, but the light bulb still survived.

Against the farther wall was the door that was mentioned in the instruction sheet enclosed within the Letter—the door with the dial built into its center. A vault, the instruction sheet had said.

He walked across the floor, leaving footprints behind him in the dust, and knelt before the door.



With his shirt-sleeve he wiped the dust from the lock and read the numbers there. He lay the sheet upon the floor and grasped the dial. Turn the indicator first to 6, then to 15, back to 8, then to 22 and finally to 3. He did it carefully, following the instructions, and at the final turn to 3 he heard the faint chucking sound of steel tumblers dropping into place.

He grasped the handle of the door and tugged and the door came open, slowly because it was heavy.

He went inside and thumbed the switch and the lights came on and everything was exactly as the instruction sheet had said. There was the bed and the machine beside it and the great steel box standing in one corner.

The air was foul, but there was no dust, since the vault was not tied in with the air-conditioning system which through centuries had spread the dust through all the other rooms.

Standing there alone, in the glare of the bulb, with the bed and machine and great steel box before him, terror came upon him, a ravening terror that shook him even as he tried to stand erect and taut to keep it away from him—a swift backlash of fear garnered from the many generations of unknowing and uncaring.

Knowledge—and there was a fear of knowledge, for knowledge was an evil thing. Years ago they had decided that, the ones who made decisions for the Ship, and they had made a law against Reading and they had burned the books.

The Letter said that knowledge was a necessary thing.

And Joshua, standing beside the tomato tank, with the other tanks and their growing things about him, had said that there must be reason and that knowledge would disclose the reason.

But it was only the Letter and Joshua—only the two of them against all the others of them, only the two of them against the decision that had been made many generations back.

No, he said, talking to himself, no, not those two alone—but my father and his father before him and fathers before that, handing down the Letter and the Book and the art of Reading. And he, himself, he knew, if he had had a child, would have handed him the Letter and the Book and would have taught him how to read. He could envision it—the two of them crouched in some obscure hiding beneath the dim glow of a bulb, slowly studying out the way that letters went together to form the words, doing a thing that was forbidden, continuing a chain of heresy that had snaked its way throughout the Folk for many generations.

And here, finally, was the end result, the bed and machine and the great steel box. Here, at last, was the thing to which it all had pointed.

He went to the bed, approaching it gingerly, as if it might be a hidden trap. He poked and prodded it and it was a bed and nothing more.

Turning from the bed to the machine, he went over it carefully, checking the wiring contacts as the instructions said he should, finding the cap, finding the switches, checking on other vital points. He found two loose contact points and he tightened them, and finally, after some hesitation, he threw on the first switch, as the instructions said he should, and the red light glowed.

So he was all ready.

He climbed onto the bed and took up the cap and set it on his head, twisting it securely into place. Then he lay down and reached out and snapped on the second switch and there was a lullaby.

A lullaby, a singing, a tune running in his brain and a sense of gentle rocking and of drowsiness.

Jon Hoff went to sleep.

HE WOKE and there was knowledge. A slow, painful groping to recognize the place, the wall without the Holy Picture, the strange machine, the strange thick door, the cap upon his head.

His hands went up and took off the cap and he held it, staring at it, and slowly he knew what it was. Bit by painful bit, it all came back to him, the finding of the room, the opening of the vault, checking the machine and lying down with the cap tight upon his head.

The knowledge of where he was and why he was there—and a greater knowledge.

A knowing of things he had not known before.

Of frightening things.

He dropped the cap into his lap and sat stark upright, with his hands reaching out to grasp the edges of the bed.

Space! An emptiness. A mighty emptiness, filled with flaming suns that were called the stars. And across that space, across the stretches of it too vast to be measured by the mile, too great to be measured by anything but light-years, the space crossed by light in the passage of a year, sped a thing that was called a ship—not the Ship, Ship with a capital S, but simply a ship, one of many ships.

A ship from the planet Earth—not from the sun itself, not from the star, but from one of many planets that circled round the star.

It can't be, he told himself. It simply cannot be. The Ship can't move. There can't be space. There can't be emptiness. We can't be a single dot, a lost and wandering mote in the immensity of a universal emptiness, dwarfed by the stars that shine outside the port.

Because if that were so, then they stood for nothing. They were just casual factors in the universe. Even less than casual factors. Less than nothing. A smear of wandering, random life lost amid the countless stars.

He swung his legs off the bed and sat there, staring at the machine.

Knowledge stored in there, he thought. That's what the instruction sheet had said. Knowledge stored on spools of tape, knowledge that was drummed into the brain, that was impressed, implanted, grafted on the brain of a sleeping man.

And this was just the beginning. This was only the first lesson. This was just the start of the old dead knowledge scrapped so long ago, a knowledge stored against a day of need, a knowledge hid away. And it was his. It lay upon the spools, it lay within the cap. It was his to take and his to use—and to what purpose? For there was no need to have the knowledge if there were no purpose in it.

And was it true?

That was the question.

Was the knowledge true?

How could you know a truth? How could you spot an untruth?

There was no way to know, of course—not yet was there a way to know the truth. Knowledge could be judged by other knowledge, and he had but little knowledge—more than anyone within the ship had had for years, yet still so little knowledge. For somewhere, he knew, there must be an explanation for the stars and for the planets that circled around the stars and for the space in which the stars were placed

—and for the ship that sped between the stars.

The Letter had said *purpose* and it had said *destination* and those were the two things he must know—the purpose and the destination.

He put the cap back in its place and went out of the vault and locked the door behind him and he walked with a slightly surer stride, but still with the sense of guilt riding on his shoulders. For now he had broken not only the spirit, but the letter of the law—he was breaking the law for a reason and he suspected that the reason and the purpose would wipe out the law.

He went down the long flights of the escalator stairs to the lower levels.

He found Joe in the lounge, staring at the chess board with the pieces set and ready.

"Where have you been?" asked Joe. "I've been waiting for you."

"Just around," said Jon.

"This is three days," said Joe, "you've been just around."

He looked at Jon quizzically.

"Remember the hell we used to raise?" he asked. "The stealing and the tricks?"

"I remember, Joe."

"You always got a funny look about you, just before we went off on one of our pranks. You have that same look now."

"I'm not up to any pranks," said Jon. "I'm not stealing anything."

"We've been friends for years," said Joe. "You got something on your mind . . ."

Jon, looking down at him, tried to see the boy, but the boy was gone. Instead was the man who sat beneath the Picture, the man who read the Ending, the pious man, the good man, a leader of the Ship's community.

He shook his head. "I'm sorry, Joe."

"I only want to help."

But if he knew, thought Jon, he wouldn't want to help. He'd look at me in horror, he'd report me to the chapel, he'd be the first to cry heresy. For it was heresy, there was no doubt of that. It was a denial of the Myth, it was a ripping away of the security of ignorance, it was a refutation of the belief that all would be for the best, it was saying they could no longer sit with folded hands and rely upon the planned order of the Ship.

"Let's play a game," he said with resolve.

"That's the way you want it, Jon?" demanded Joe.

"That's the way I want it."

"Your move," said Joe.

Jon moved his queen pawn. Joe stared at him.

"You play a king's pawn game."

"I changed my mind," said Jon. "I think this opening's better."

"As you wish," said Joe.

They played. Joe won without any trouble.

At last, after days of lying on the bed and wearing the cap, of being lullabyed to sleep and waking with new knowledge, he knew the entire story.

He knew about the Earth and how Earthmen had built the ship and sent it out to reach the stars and

he understood a little about the reaching for the stars that had driven humans to plan the ship.

He knew about the selection and the training of the crew and the careful screening that had gone into the picking of the ancestors of the colonists-to-be, the biological recommendations which had determined their mating so that when the fortieth generation should finally reach the stars they would be a hardy race, efficient to deal with the problems there.

He knew about the educational setup and the books that had been intended to keep knowledge intact and he had some slight acquaintance with the psychology involved in the entire project.

But something had gone wrong.

Not with the ship, but with the people in it.

The books had been fed into the converter.

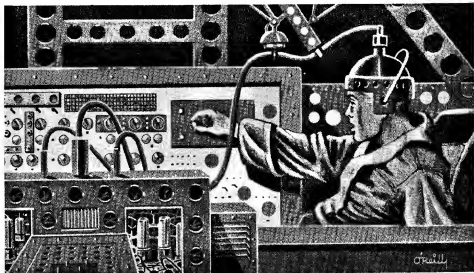
The Myth had risen and Earth had been entirely forgotten.

The knowledge had been lost and legend had been substituted.

In the span of forty generations the plan had been lost and the purpose been forgotten and the Folk lived out their lives in the sure and sane belief that they were self-contained, that the Ship was the beginning and the end, that by some divine intervention the Ship and the people in it had come into being and that their ordered lives were directed by a worked-out plan in which everything that happened must be for the best.

They played at chess and cards and listened to old music, never questioning for a moment who had invented cards or chess or who had created music. They whiled away not hours, but lives, with long gossiping and told old stories and swapped old yarns out of other generations. But they had no history and they did not wonder and they did not look ahead—for everything that happened would be for the best.*

*The importance of written records as opposed to memory insofar as accuracy is desirable was pointed out many years ago by Sir George Carneall Lewis, the British historian, who made an exhaustive study of the credibility of early Roman history. As a result of this study, Lewis arrived at the conclusion that a tradition of a past event is not transmitted orally from generation to generation with anything like accuracy of detail for more than a century, and in most instances for a considerably lesser period. Therefore, on a thousand-year flight, if written records were not kept, it is extremely likely that Earth would be forgotten or, at best, would exist only as a legend. A thousand years, in this day of multi-billion financing, seems a small number and is easy to say or write, but is terribly long in actual time. The time since the invasion of England by William the Conqueror is not yet a thousand years. America was discovered by the Vikings not quite a thousand years ago, by Columbus less than half a thousand years ago. If records had not been kept of the Columbus voyage or of the Norman invasion, they would now be forgotten incidents and subject to the speculation of historian theorists. As it is, the Viking voyages to America are very imperfectly known, since only fragments of their record exist, written down many years after the event. From the sagas which commemorated them.—The Author.



"Then he lay down and snapped on the second switch."

For year on empty year the Ship was all they had known. Even before the first generation had died the Earth had become a misty thing far behind, not only in time and space, but in memory as well. There was no loyalty to Earth to keep alive the memory of the Earth. There was no loyalty to the Ship, because the Ship had no need of it.

The Ship was a mother to them and they nestled in it. The Ship fed them and sheltered them and kept them safe from harm.

There was no place to go. Nothing to do. Nothing to think about. And they adapted.

Babies, Jon Hoff thought.

Babies cuddling in a mother's arms. Babies prattling old storied rhymes on the nursery floor.

And some of the rhymes were truer than they knew.

It had been spoken that when the Mutter came and the stars stood still the End was near at hand.

And that was true enough, for the stars had moved because the ship was spinning on its longitudinal axis to afford artificial gravity.

But when the ship neared the destination, it would automatically halt the spin and resume its normal flight, with things called gyroscopes taking over to provide the gravity.

Even now the ship was plunging down toward the star and the solar system at which it had been aimed. Plunging down upon it if—and Jon Hoff sweated as he thought of it—if it had not already overshoot its mark.

For the people might have changed, but the ship did not. The ship did not adapt. The ship remembered when its passengers forgot. True to the taped instructions that had been fed into it more than a thousand years before, it had held its course, it had retained the purpose, it had kept its rendezvous and even now it neared its destination.

Automatic, but not entirely automatic.¹

It could not establish an orbit around the target planet without the help of a human brain. Without a human hand to tell it what to do. For a thousand years it might get along without its human, but in the final moment it would need him to complete its purpose.

And I, Jon Hoff told himself, I am that man.

One man. Could one man do it?

He thought about the other men. About Joe and Herb and George, and all the rest of them and there was none of them that he could trust, no one of them to whom he could go and tell what he had done.

He held the ship within his mind. He knew the theory and the operation, but it might take more than theory and more than operation. It might take familiarity and training. A man might have to live with a ship before he could run it. And there'd be no time for him to live with it.

HE STOOD beside the machine that had given him the knowledge, with all the tape run through it now, with its purpose finally accomplished, as the Letter had accomplished its pur-

¹ Throughout the story I have emphasized that the spaceship concerned operated automatically. In view of the rapid strides which are being made in this direction at the moment, it does not seem that such a development is unreasonable. Automatic piloting has been demonstrated for several years to hold the plane on course. In March, 1953, the Minneapolis-Honeywell Regulator company of Minneapolis, Minn., announced the development of an electrical "brain" which would take a plane off the ground, fly it on a prescribed course to its destination and then land it without a human hand touching the controls. The "brain" has been delivered to the air force at Wright Field, Ohio, and will be given flight tests sometime this year in a B-50 bomber. The flight of the plane is controlled by a tape upon which a flight plan is punched by means of a special coding device, the tape being fed into the brain. The "brain" thus "memorizes" the flight plan from the tape and converts information from a myriad of instruments, sensors, computers, and other navigational aids into electrical impulses that go to the plane's machinery to carry out the plan.—The Author.

pose, as Mankind and the Ship would accomplish theirs if his brain were clear and his hand were steady.² And if he knew enough.

There was yet the chest standing in the corner. He would open that—and it finally was done. All that those others could do for him would then be done and the rest would depend on him.

Moving slowly, he knelt before the chest and opened the lid.

There were rolls of paper, many rolls of it, and beneath the paper books, dozens of books, and in one corner a glassite capsule enclosing a piece of mechanism that he knew could be nothing but a gun, although he'd never seen one.

He reached for the glassite capsule and lifted it and beneath the capsule was an envelope with one word printed on it:

KEYS.

He took the envelope and tore it open and there were two keys. The tag on one of them said: CONTROL ROOM. The tag on the other: ENGINE ROOM.

He put the keys in his pocket and grasped the glassite capsule. With a quick twitch, he wrenched it in two. There was a little puffing sound as the vacuum within the tube puffed out, and the gun lay in his hands.

It was not heavy, but heavy enough to give it authority. It had a look of strength about it and a look of grim cruelty, and he grasped it by the butt and lifted it and pointed and he felt the ancient surge of vicious power surge through him—the power of Man, the killer—and he was ashamed.

He laid the gun back in the chest and drew out one of the rolls of paper. It cracked, protesting, as he gently unrolled it. It was a drawing of some sort, and he bent above it to make out what it was, worrying out the printed words that went with the lines.

He couldn't make head or tail of it, so he let loose of it and it rolled into a cylinder again as if it were alive.

He took out another one and unrolled it and this time it was a plan for a section of the ship.

Another one and another one, and they were sections of the ship, too—the corridors and escalators, the observation blisters, the cubicles.

And finally he unrolled one that showed the ship itself, a cross-section of it, with all the cubicles in place and the hydroponic gardens. And up in the nose the control room and in the back the engine rooms.

He spread it out and studied it and it wasn't right, until he figured out that if you cut off the control room and the engine room it would be. And that, he told himself, was the way it should be, for someone long ago had locked both control and engine rooms

² The idea of such an educational device was first advanced in 1911 by Hino Gerschlack, editor of this magazine, in his science-fiction classic, *RAIPH 124C 41-1*. In that story the machine was called a *hypnoscope*. Experiments in the use of such a device date back to 1922, when it was used at the Pensacola Training Station by the United States Navy to teach the Continental Code. The theory behind the experiments is that when a person sleeps his subconscious still is open to suggestion and can therefore learn. In fact, actual experience has proved that many individuals who fail to master a subject while awake are able to master it while asleep, and there is ground for the belief that knowledge impressed upon the brain of a sleeper will be retained longer and in clearer detail than a lesson learned while awake. Mr. Gerschlack, *RAIPH 124C 41-1*, pointed out that one advantage to such an educational device would be the useful employment of sleeping time, which is now waste time so far as any actual human improvement or advancement is concerned. He envisioned a society which would read all its books, do all its studying while asleep, which would mean that the eight hours usually wasted in sleep would be spent as reading time, thus resulting in a vastly better educated society. Experiments have been carried out recently by the British Overseas Airways, the Institute of Linguistics at Wichita, Kan., the Institute of Language and Linguistics at Georgetown University, and by Charles R. Elliott, psychologist at the University of North Carolina. In all these experiments pillow-talk or earphone arrangements have been used to convey information over the lesson which the sleeper is to learn. This, however, would seem to be a crude approach to the problem, and there is no doubt that, before the concept can be employed to full advantage and employed in mass education, some drastically different method must be found. It is my understanding that such a method is now in process of development.—The Author.

to keep them safe from harm. To keep them safe from harm against this very day.

To the Folk the engine room and control room had simply not existed, and that was why, he told himself, the blueprint had seemed wrong.

He let the blueprint roll up unaided and took out another one, and this time it was the engine room. He studied it, crinkling his brow, trying to make what was there, and while there were certain installations he could guess at, there were many that he couldn't.

He made out the converter and wondered how the converter could be in a locked engine room when they'd used it all these years. But finally he saw that the converter had two openings, one beyond the hydroponics gardens and the other from within the engine room itself.

He let go of the blueprint and it rolled up, just like all the others. He crouched there, rocking on his toes a little, staring at the blueprints.

Thinking: If there were any further proof needed to convince me, there lies that simple proof.

Plans and blueprints for the ship. Plans dreamed by men and drawn by human hands. A dream of stars drawn on a piece of paper.

No divine intervention. No myth.

Just simple human planning.

He thought of the Holy Pictures and he wondered what they were. They, too—could they, too, be as wide of the mark as the story of the Myth? And if they were it seemed a shame. For they were such a comfort. And the Belief as well. It had been a comfort, too.

He crouched in the smallness of the vault, with the machine and bed and chest, with the rolled-up blueprints at his feet, and brought up his arms across his chest and hugged himself in what was almost abject pity.

He wished that he had never started. He wished there had been no Letter. He wished that he were back again, in the ignorance and security. Back again, playing chess with Joe.

Joe said, from the doorway: "So this is where you've been hiding out."

He saw Joe's feet, planted on the floor, and he let his eyes move up, following Joe's body until he reached his face.

The smile was frozen there. A half-smiled smile frozen solid on Joe's face. "Books!" said Joe.

It was an obscene word. The way Joe said it, it was an obscene word.

As if one had been caught in some unmentionable act, surprised with a dirty thought dangling naked in one's mind.

"Joe—" said Jon.

"You wouldn't tell me," said Joe. "You said you didn't want my help. I don't wonder that you didn't..."

"Joe, listen..."

"Sneaking off with books," said Joe.

"Look, Joe. Everything's all wrong. People like us made this ship. It is going somewhere. I know the meaning of the End..."

The wonder and the horror was gone from Joe's face now. It had gotten bleak. It was a judge's face. It towered above him and there was no mercy in it—not even any pity.

"Joe!"

Joe turned around, swiftly, leaping for the door.

"Joe! Wait a minute, Joe!" But he was gone.

The sound of his feet

came back, the sound of them running along the corridor, heading for the escalator that would take him down to the living levels.

Running back and going down to cry up the pack. To send them lunging through the entire ship hunting down Jon Hoff. And when they caught Jon Hoff...

When they caught Jon Hoff that would be the End for always. That would make the End the kind of unknown End that was spoken in the chapel. For there would be no other—there would never be another who would know the Meaning and the Purpose and the Destination.

And because of that, thousands of men and women would have died in vain. The sweat and genius and longing of the people who had launched the ship would have been for nothing.

It would be a terrible waste. And wasting was a crime.

You must not waste. You must not throw away.

And that meant human lives and dreams as well as food and water.

JON'S hand reached out and grasped the gun and his fingers tightened on it as the rage grew in him, the rage of desperation, the last-hope rage, the momentary, almost blinded madness of a man who sees the rug of life being deliberately jerked from beneath his feet.

Although it was not his life alone, but the lives of all the others—Mary's life, and Herb's and Louise's and Joshua's as well.

He was running at full tilt when he went out the door and he skidded as he made the sharp right-angle turn into the corridor. He flung himself in the direction of the escalator and in the darkness felt the treads beneath his feet, and he breathed a thankfulness for the many times he had gone from the living quarters to the center of the ship, feeling his way in darkness. For now he was at home in the darkness and that was an advantage he had that Joe did not possess.

He hurled himself down the stairs, skidded and raced along the corridor, found the second flight—and ahead of him he heard the running, stumbling footsteps of the man who fled ahead of him.

In the next corridor, he knew, there was a single lamp, burning dimly at the end of the corridor. If he could reach the corridor in time...

He went down the treads, one hand on the rail to keep himself from falling, scarcely touching the treads, sliding down rather than running.

He hit the floor in a crouch, bent low, and there, outlined against the dimly burning lamp, was a running figure. He lifted the gun and pressed the button and the gun leaped in his hands and the corridor suddenly was filled with flame.

The light blinded him for a second and he remained crouching there and the thought ran through him: I've killed Joe, my friend. Except it wasn't Joe.

It wasn't the boy he'd grown up with. It wasn't the man who had sat across the chess board from him. It was not Joe, his friend.

It was someone else—a man with a judge's face, a man who had run to cry up the pack, a man who would have condemned them all to the End that was unknown.

He felt somehow that he was right, but nevertheless he trembled.



His sight came back and there was a huddled blackness on the floor.

And now his hand was shaking and he crouched there, without moving, and felt the sickness heaving at his stomach and the weakness crawl along his body.

You must not waste.

You must not throw away.

Those were spoken laws. But there were other laws that never had been spoken because there had been no need to speak them. They had not spoken you must not steal another's wife, they had not spoken you must not bear false witness, they had not spoken you must not kill—for those were crimes that had been wiped out long before the star-ship had leaped away from Earth.

Those were the laws of decency and good taste.

And he had broken one of them.

He had killed a fellow man.

He had killed his friend.

Except, he told himself, he was not my friend. He was an enemy—the enemy of all of us.

Jon Hoff stood erect and stopped his body's shaking. He thrust the gun into his belt and walked woodenly down the corridor toward the huddle on the floor.

The darkness made it a little easier, for he could not see what lay there so well as if it had been light. The face lay against the floor and he could not see the face. It would have been harder had the face stared up at him.

He stood there considering.

In just a little while the Folk would miss Joe and would start to hunt for him. And they must not find

him. They must never know. The idea of killing long since had been wiped away; there could be no suggestion of it. For if one man killed, no matter how or why, then there might be others who would kill as well. If one man sinned, his sinning must be hidden, for from one sinning might come other sinning and when they reached the new world, when (and if) they reached the target planet, they would need all the inner strength, all the fellowship and fellow-security they could muster up.

He could not hide the body, for there was no hiding place but could be found.

He could not feed it to the converter because he could not reach the converter. To reach it he'd have to go through the hydroponic gardens.

But no, of course, he wouldn't.

There was another way to reach the converter—through the engine room.

He patted his pocket and the keys were there.

He bent and grasped Joe and recoiled at the touch of the flesh, still warm. He shrank back against the metal wall and stood there and his stomach churned and the guilt of what he'd done hammered in his head.

He thought of his father talking to him—the granite-faced old man—and he thought of the man, far back, who had written the Letter, and he thought of all the others who had passed it on, committing heresy for the sake of truth, for the sake of knowledge and salvation.

There had been too much ventured, too much dared and braved, too many lonely nights of wondering if what one did was right, to lose it now because of squeamishness or guilt.

He walked out from the wall and grasped the body and slung it on his shoulder.

It dangled.

It gurgled.

Something wet and warm trickled down his back. He gritted his teeth to keep them from chattering. And he staggered along beneath his burden, climbing the long-stilled escalators, clopping along the corridors, heading for the engine room.

At last he reached the door and laid the burden down to fumble for the keys.

He found them and selected the right one and turned it in the door, and when he pushed against the door the door swung slowly open. A gust of warm air came out and slapped him in the face. Lights glowed brightly and there was a humming song of power and the whine of spinning metal.

He reached down and lifted Joe again and went in and closed the door. He stood staring down the long paths that ran between the great machines.

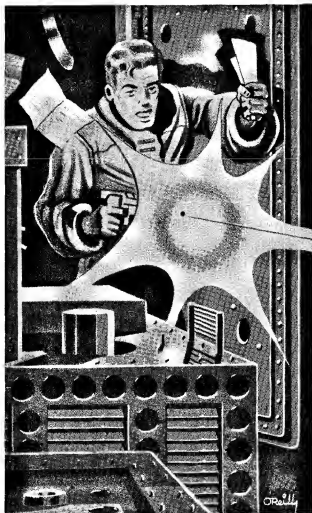
There was one machine that spun, and he recognized it—a gyroscope, a stabilizer hanging in its gimbals, humming to itself.

How long, he wondered, how long would it take a man to understand all there was to know about all these massive, intricate machines? How far, he wondered, have we fallen from the knowledge of a thousand years ago?

And the thing he carried dangled on his shoulder and he heard the slow, deliberate dripping of the warm, sticky liquid splashing on the floor.

Horror and wonder—a going back. A going back through a thousand years to a knowledge that could build machines like these. A going back much farther to an instability of human emotions that would drive one man to kill another man.

I must be rid of him, Jon Hoff thought bitterly. I must be rid of him. But I never will be. When he has disappeared, when he has become something



"... the corridor suddenly was filled with flame."

other than what he is, when the substances of him have become something else, I still shall not be rid of him. Never!

He found the converter door and braced himself in front of it. He tugged at the door. It stuck and he jerked at it and it came free. The maw gaped, large enough to take a human body, and from behind the baffles he could hear the roaring of the power and imagined that he caught the hellish flicker of the ravening fire.

He balanced the body on his shoulder and slid it off as gently as he could, feeding it to the maw. He gave it a final push and closed the door and trod hard upon the feeder mechanism.

The deed finally was done.

He reeled back from the converter's face and mopped his brow and now the burden was gone, but it still was with him.

As it always would be, he thought. *As it always would be.*

The footsteps came at him and he did not swing around to face them, for he knew whose the footsteps were—the ghostly footsteps that would dog him all his life—the footsteps of guilt walking in his mind.

A voice said: "Lad, what have you done!"

Jon said: "I have killed a man. I have killed my friend."

And he swung around to face the footsteps and the voice, because neither one was ghost.

Joshua said: "There was a reason for it, lad?"

"A reason," said Jon Hoff. "A reason and a purpose."

"You need a friend," Joshua told. "You need a friend, my boy."

Jon nodded. "I found the purpose of the Ship. And the destination. He found me out. He was going to denounce me. I—"

"You killed him."

"I thought: One life or all? I only took one life. He would have taken all."

They stood for a long moment, facing one another. The old man said: "It is not right to take a life. It is not right nor proper."

He stood there, stumpy and stolid, against the background of the engines, but there was something vital in him, some driving force within him as there was in the engines.

"Nor is it right," he said, "to condemn the Folk to a fate that was not intended. It is not right to let a purpose go by default and ignorance."

He asked: "The purpose of the Ship? It is a good purpose?"

"I do not know," said Jon. "I can't be sure. But at least it is a purpose. A purpose, any purpose, is better than none at all."

He raised his head and brushed back his hair, plastered down with sweat across his brow.

"All right," he said. "I'll go along with you. I've taken one life, I'll not take any more."

Joshua spoke slowly, gently. "No lad. I am the one who goes along with you."

TO SEE the great depth of the emptiness in which the stars blazed like tiny, eternal watch-fires, was bad enough when one looked out a blister port. To see it from the control room, where the great glass plate opened out into the very jaws of space, was something else again.

You could look down and down and there was no bottom and you could look up or out and there was no stopping, and one moment you would swear that a certain star could be reached out for and plucked and

the next moment it was so far away that your brain spun with the very thought of distance.

The stars were far.

All but one of them.

And that one blazed, a flaming sun, off toward the left.

Jon Hoff flicked a glance at Joshua and the old man's face was frozen in a mask that was disbelief and fear and something touching horror.

And, he thought, I knew what it *might* be like. I had some idea. But he had none at all.

He pulled his eyes from the vision plate and saw the banks of instruments and his stomach seemed to turn over and his fingers were all thumbs.

No time to live with the ship, he told himself. No time to get to know it as it really is. What must be done he must do by intellect alone, by the sketchy knowledge impressed upon his brain—a brain that was not trained or ready, that it might take many years to make trained and ready.

"What are we to do?" Joshua whispered. "Lad, what are we to do?"

And Jon Hoff thought: *What are we to do?*

He walked slowly forward and mounted the steps to the chair that said NAVIGATOR on the back of it.

Slowly he hoisted himself into the chair and it seemed that he sat on the edge of space itself, that he sat upon a precipice from which at any moment he might slip off and tumble into space.

He put his hands down carefully and gripped the chair's arms and hung on tight and fought to orient himself, to know that he sat in a navigator's chair and that in front of him were trips and buttons that he could press or trip and that the pressing and the tripping of them would send signals to the pulsing engine room.

"That star," said Joshua. "That big one off to the left. The burning one . . ."

"All the stars are burning."

"But that one. The big one . . ."

"That's the one we headed for a thousand years ago," said Jon.

And he hoped it was. He wished he could be certain that it was the one.

Even as he thought it, bells of alarm were ringing in his brain.

There was something wrong.

Something very wrong.

He tried to think, but space was too close to think, space was too big and empty and there was no use of thinking. One could not outwit space. One could not fight space. It was too big and cruel. Space did not care. It had no mercy in it. It did not care what happened to the ship or the people in it.

The only ones who had ever cared had been the people back on Earth who had launched the ship, and, for a little while, the Folk who rode the ship. And finally, he and one old man. They two against all space.

The only ones who cared.

"It's bigger than the others," said Joshua. "We are closer to it."

That was what was wrong!

That was what had rung the alarm within his mind.

The star was far too close!

It shouldn't be that close!

He wrenched his eyes from space and looked down at the control board and all he saw was a meaningless mass of trips and levers, banks of buttons, rows of dials.

He watched the board and slowly his mind began to sort it out, to make some sense of it, the knowledge

the machine had pounded into him beginning to take over.

He read the dials and he got some knowledge from them. He located certain controls that he had to know about.

Mathematics rose unbidden in his brain and did a nightmare dance.

It was useless, he told himself. It had been a good idea, but it hadn't worked. You couldn't educate a man by a machine.

You couldn't pound into him the knowledge necessary to navigate a ship.

"I can't do it, Joshua," he cried. "It's impossible to do it."

Where were the planets? he wondered. How could he find the planets? And when he found them, if he found them, what would he do then?

The ship was falling toward the sun.

He didn't know where to look for planets.

And they were going too fast—they were going far too fast.

Sweat burst out upon him, beading his brow and running down his face, dripping from his armpits.

"Take it easy, lad. Take it easy now."

He tried to take it easy, but it didn't work.

He reached down and slid open the tiny drawer beneath the control panel. There was paper there and pencils. He took out a sheet of paper and a pencil. He jotted down the readings on the dials.

Absolute velocity.

Increase of velocity.

Distance from the star. Angular approach to the star.

There were other readings, but those were the essential ones, those were the ones that counted.

And one thought rose in his brain, one thought that had been impressed upon it time after time:

To navigate a ship is not a matter of driving it toward a certain point, but in knowing where it will be at any time within the immediate future.

He made his calculations, the mathematics struggling upward into his consciousness.

He made the calculations and he made a graph and then reached out and pushed a control lever forward two notches and hoped that he was right.

"You are making it out?" Joshua asked.

Jon shook his head.

"We'll know—an hour from now we'll know."

A slight increase in thrust to keep the ship from plunging too close toward the sun. Skirting the sun and curving back, under the attraction of the sun, making a long wide loop out into space, and then back toward the sun again.

That was the way it worked—that was the way he hoped it worked.

That was the way the machine had told him it might work.

He sat there limp, wondering about the strange machine, wondering how much reliance you could put in tape running on a spool and a cap clamped on your head.

"We'll be here a long time," said Joshua.

Jon nodded. "I am afraid so, Joshua. It will take a long time."

"Then," the old man said. "I'll go and get some food."

He started toward the door, then turned back.

"Mary?" he asked.

Jon shook his head. "Not yet. Let's leave them in peace. If we fail . . ."

"We won't fail."

Jon spoke sharply. "If we do, it's best they never know."

"You may be right," the old man said. "I'll go and get the food."

TWO hours later Jon knew that the ship would not crash the sun. It would come close, almost too close for comfort—only a million miles or so, but the ship's velocity would be such that it would skim past the sun and climb out into space again, pulled to one side by the attraction of the sun, fighting outward against the pull of the flaming star, dropping off its speed on the upward, outward haul.

With its flight path curved inward by the sun, it would establish an orbit—a highly dangerous orbit, for on the next swing around, left to its own devices, the ship would crash the sun.

Between the time that it passed the sun and curved inward once again he must establish control over it, but the important thing was that he had bought some time. Without the added two notches of velocity he had gained by the shoving of the lever, he was sure, the ship either would have plunged into the sun or would have established a tightening orbit about it from which even the fantastic power of the mighty engines could not have pulled it free.

He had time and he had some knowledge, and Joshua had gone to bring some food.

He had time and he had to use the time. He had the knowledge, lying somewhere in his brain, planted there, and he must dig it up and put it to the job for which it was intended.

He was calmer now and a little surer of himself.

And he wondered, in his own awkwardness, how the men who had launched the ship from Earth, the men who had watched and tended it before the ignorance, could have shot so closely. Chance, perhaps, for it would have been impossible to shoot a thousand-year-long missile at a tiny target and have it hold its course . . . or would it have been possible?

Automatic — automatic — automatic. The word thrummed in his brain. The single word over and over again. The ship was automatic. It ran itself, it repaired itself, it serviced itself, it held true to the target. It needed only the hand and brain of Man to tell it what to do. Do this, the hand and brain of Man would say, and the ship would do it. That was all that was needed—the simple telling of instructions.

The problem was how to tell the ship. What and how to tell it.

And there were certain facts that haunted him about the telling of the ship.

He got down from the navigator's chair and prowled about the room. There was a thin fine dust on everything, but when he rubbed his sleeve along the metal, the metal shone as brightly as on that day it had been installed.

He found things, and some of them he knew and recognized and some of them he didn't.

But, most important, he found the telescope, and after some trials and errors, he remembered how to operate it.

And now he knew how to find the planets—if this were the target star and there were any planets.

Three hours gone and Joshua had not returned. It was too long to be gone just to get some food.

He paced up and down the room, fighting down his fears.

Something had happened, something must have happened to the old man.

He went back to the telescope and began the work of running down the planets. It was hard work and purposeless at first, but bit by bit, with the handling of the instruments, the facts started drifting up into his consciousness.

He found one planet—and there was a knock upon the door.

He left the telescope and strode across the room.

The corridor was full of people and all at once they were shouting at him, shouting hateful words, and the roaring of their voices was a blast of anger and of condemnation that sent him back a step.

In front were Herb and George and behind them all the others—men and women both, and he looked for Mary, but he didn't see her.

The crowd surged forward and there was hatred and a loathing on their faces and the fog of fear came out of them and struck deep into Jon Hoff.

His hand went down to his waistband and closed upon the gun butt and he dragged the weapon free.

He tilted the gun downward and stabbed at the button, just one quick, light stab. Light bloomed out and filled the doorway and the crowd went reeling back.

The door itself was blackened and there was the smell of blistered paint.

Jon Hoff spoke evenly: "This is a gun," he said. "With it I can kill you. With it I *will* kill you if you interfere. Stand back. Go back where you came."

Herb took a forward step and stopped.

"You are the one who is interfering," he declared.

Herb took another step.

Jon brought the gun up and lined its sights on him.

"I've killed one man," he said, "and I'll kill another."

And he thought: So easy to talk of killing. Of taking human life. So ready to do it, now that I've killed once.

"Joe is missing," said Herb. "We have been hunting for him."

"You need to hunt no more," said Jon.

"But Joe was your friend."

"And so are you," said Jon. "But the purpose is too big for friendship. You're with me or against me. There is no middle ground."

"We'll read you out of chapel,"

"You'll read me out of chapel," said Jon, mocking him.

"We'll exile you to the central ship."

"We've been exiled all our lives," said Jon. "For many generations. And we didn't even know it. We didn't know. I tell you. And because we didn't know, we fixed up a pretty story. We fixed up a pretty story and we convinced ourselves of it and we lived by it. And when I come along and show you it was no more than a pretty story, dreamed up because we *had* to have a story—*had* to have, I say—you are ready to read me out of chapel and to exile me. You'll have to do better than that, Herb. Much better than that."

He patted the gun.

"I can do better than that," he said.

"Jon, you are mad."

"And you are a fool," said Jon.

At first he had been afraid, then he had been angry and now there was only contempt—only contempt for them, huddled in the corridor, voicing feeble threats.

"What did you do with Joshua?" he asked.

"We tied him up," said Herb.

"Go back and untie him and send me up some food," he said.

They waved. He made a threatening motion with the gun.

"Get," he said.

They ran.

He slammed the door and went back to the telescope.

HE FOUND six planets and two had atmospheres, No. 2 and No. 5. He looked at his watch and many hours had gone. Joshua had still not appeared.

There had been no rap at the door. There was no food and water.

He climbed the steps to the navigator's chair again.

The star was far astern.

The velocity had slid way off, but was still too fast.

He pulled the lever back and watched the velocity indicator drop.

It was safe to do that—he hoped it was safe to do it. The ship was thirty million out and it should be safe to cut velocity.

He studied the board and it was clearer now—more understandable, more things he knew about.

It was not so hard, he thought. It would not be too hard. You had time. You had plenty of time. You had to plan ahead, but you had time to do it.

He studied the board and he found the computer he had missed before, the little metal brain—and that was how you told the ship. That was what he had missed before—that was what he had wondered about—how to tell the ship.

And this was the way you told it. You told the little brain.

And the one word—*automatic*—kept on hounding him.

He found the stud that was labeled *telescope* and the one that was labeled *orbit* and still another that was labeled *landing*.

That was it, he thought.

After all the worry, after all the fears, it was as simple as all that.

For that would have been the way those back on Earth would have made the ship. Simple. Simple beyond belief. So simple that any fool could land it. Just anyone at all who could punch a button.

For certainly they must have feared or guessed what might happen on the ship after several generations. They must have known how Earth would be forgotten and that there be a cultural adaptation to the ship.

Feared or guessed—or planned?

Was the culture of the ship a part of the master plan?

Could the Folk have lived through a thousand years if they had known of the purpose and the destination?

And the answer seemed to be that they couldn't have been able to, for they would have felt robbed and cheated; would have gone mad with the knowledge that they were no more than carriers of life, that their lives and the lives of many generations after them would be canceled out so that after many generations their descendants could arrive at the target planet.

There had been only one way to beat that situation—and that was to forget what it was all about. And that is what had happened and it had been for the best.

The Folk, after the first few generations, had lived their little lives in the little circle of their home-grown culture and that had been enough. After that

the thousand years had been as nothing, for no one knew about the thousand years.

And all the time the ship bored on through space, heading for the target, heading straight and true.

Jon Hoff went down to the telescope and centered Planet V and clamped over the radar controls that would hold it centered. He went back to the computer and pushed the stud that said *telescope* and the other stud that said *orbit*.

Then he sat down to wait.

There was nothing more to do.

PLANET V was death.

The analyzer told the story.

The atmosphere was mostly methane. The gravity thirty times too great. The pressure beneath the boiling clouds of methane close to a thousand atmospheres.

There were other factors, too. But any one of those three would have been enough.

Jon Hoff pulled the ship out of its orbit, headed it sunward. Back at the telescope, he found Planet II, locked it in the sights, tied in the computer and sat down to wait again.

One chance more and that was all they had.

For of all the planets, only two had atmospheres. It had to be Planet II or none.

And if the second planet turned out to be death as well, what then?

There was one answer. There could be no other.

Head the ship toward another star, build up velocity and hope—hope that in another several generations the Folk could find a planet they could live on.

He was hungry—his belly gaunt and sore. He had found a water cooler with a few cups of liquid still intact, but he'd drunk the last of that two days before.

Joshua had not come back. There had been no sign from the Folk. Twice he had opened the door and gone out into the corridor, ready to make a dash for food and water, then reconsidered and gone back in again.

For he couldn't take the chance. He couldn't take the chance that they would sight him and run him down and not let him go back to the control room.

But the time would come before too long when he'd have to take a chance—when he'd have to make the dash. For before another day was gone he might be too weak to make it. And there were many days ahead before they reached Planet II.

The time would come when he'd have no choice. That he could stick it out was impossible. If he did not get food and water, he'd be a useless, crawling hulk with the strength and mind gone out of him by the time they reached the planet.

He went back to the control board and looked things over and it seemed to be all right. The ship still was building up velocity. The monitor on the computer was clocking its blue light and chuckling to itself, saying *everything's all right, everything's all right*.

Then he went back down the steps and to the corner where he'd been sleeping. He lay down and curled himself into a ball, trying to squeeze his belly together so it wouldn't nag him so and shut his eyes and tried to go to sleep.

With his ear against the metal he could hear the pulsing of the engines far back in their room—the song of power that ran through all the ship. And he remembered how he had thought a man might have to live with a ship to run her. But it hadn't turned out that way, although he could see how a

man might learn to live with a ship, how a ship might become a part of him.

He dozed off and woke, then dozed off again—and this time there was a voice shouting and someone hammering at the door.

He came to his feet in one lithe motion, scrambled for the door, the key already in his fist, stabbing at the lock.

He jerked the door open and Mary stumbled in. She carried a great square can in one hand and a huge sack in the other and boiling down the corridor toward the door was a running mob that brandished clubs and screamed.

Jon reached down and hauled Mary clear, then slammed the door and locked it. He heard the running bodies thud against the door and then the clubs pounding at it and the people screaming.

Jon stooped above his wife.

"Mary," he said, his voice choking and his throat constricting. "Mary."

"I had to come," she said and she was crying when she said it.

"I had to come," she said, "no matter what you did."

"What I have done," he said, "has been for the best. It was a part of the Plan, Mary. I am convinced of that. Part of the Master Plan. The people back on Earth had it all planned out. I just happened to be the one who . . ."

"You are a heretic," she said. "You've destroyed our Belief. You have set the Folk at one another's throats. You . . ."

"I know the truth," he said. "I know the purpose of the ship . . ."

She reached up her hands and cupped his face between her palms and pulled his head down and cuddled him.

"I don't care," she said. "I don't care. Not any more, I don't. I did at first. I was angry with you, Jon. I was ashamed of you. I almost died of shame. But when they killed Joshua . . ."

"What was that?"

"They killed Joshua. They beat him to death. And he's not the only one. There were others who wanted to come and help you. Just a few of them. They killed them, too."

"There's killing in the ship. And hate. And suspicion. And all sorts of ugly rumors. It never was like that before. Not before you took away Belief."

A culture shattered, he thought. Shattered in the matter of an hour. A belief twitched away in the breadth of one split second.

There was madness and killing.

Of course there'd be.

"They are afraid," he said. "Their security is gone."

"I tried to come earlier," Mary said. "I knew you must be hungry and I was afraid there'd be no water. But I had to wait until no one was watching . . ."

He held her tight against him and his eyes were a little dim.

"There's food," she said, "and water. I brought all that I could carry."

"My wife," he said. "My darling wife . . ."

"There's food, Jon. Why don't you eat?"

He rose and pulled her to her feet.

"In just a minute," he said. "I'll eat in just a minute. First I want to show you something. I want to show you Truth."

He led her up the steps.

"Look out there," he said. "That is where we're going. This is where we've been. No matter what we might have told ourselves, that out there is Truth."

PLANET II was the Holy Pictures come to life entire. There were Trees and Brooks, Flowers and Grass, Sky and Clouds, Wind and Sunshine.

Mary and Jon stood beside the navigator's chair and stared out through the vision plate.

The analyzer gurgled slightly and spat out its report.

Safe for humans, said the printed slip, adding a great deal of data about atmospheric composition, bacterial count, violet-ray intensity and many other things. But the one conclusion was enough.

Safe for humans.

Jon reached out his hand for the master switch in the center of the board.

"This is it," he said. "This is the end of the thousand years."

He turned the switch and the dials all clicked to zero. The needles found dead center. The song of power died out in the ship and there was the olden silence—the silence of long ago, of the time when the stars were streaks and the walls were floors.

Then they heard the sound.

The sound of human wailing—as an animal might howl.

"They are afraid," said Mary. "They are scared to death. They won't leave the Ship."

And she was right, he knew. That was something that he had not thought of—that they would not leave the ship.

They had been tied to it for many generations. They had looked to it for shelter and security. To them the vastness of the world outside, the never-ending sky, the lack of a boundary of any sort at all, would be sullen terror.

Somehow or other they would have to be driven from the ship—literally driven from it, and the ship locked tight so they could not fight their way back in again.

For the ship was ignorance and cowering; it was a shell outgrown; it was the womb from which the race would be born anew.

Mary asked: "What will they do to us? I never thought of that. We can't hide from them, nor . . ."

"Not anything," said Jon. "They won't do anything. Not while I have this."

He slapped the gun at his side.

"But, Jon, this killing . . ."

"There won't be any killing. They will be afraid and the fear will force them to do what must be done. After a time, maybe a long time, they will come to their senses, and then there will be no further fear. But to start with there is a need of . . ."

The knowledge stirred within his brain, the knowledge implanted there by the strange machine.

"Leadership," he said. "That is what they'll need. . . someone to lead them, to tell them what to do, to help them to work together."

He thought bitterly: I thought that it had ended, but it hasn't ended. Bringing down the ship was not enough. I must go on from there. No matter what I do, so long as I live, there will be no end to it.

There was the getting settled and the learning once again.

There were the books in the chest, he remembered, more than half the chest packed full of books. Basic texts, perhaps. The books that would be needed for the starting over.

And somewhere, too, instructions?

Instructions left with the books for a man like him to read and carry out.

INSTRUCTIONS TO BE PUT INTO EFFECT AFTER LANDING.

That would be the notation the envelope would carry, or another very like it, and he'd tear the envelope open and there would be folded pages.

Once before, in another letter, there had been folded pages.

And the second letter?

There would be one, he was sure.

"It was planned on Earth," he said. "Every step was planned. They planned the great forgetting as the only way that humans could carry out the flight. They planned the heresy that handed down the knowledge. They made the ship so simple that anyone could handle it—anyone at all.

"They looked ahead and saw what was bound to happen. Their planning has been just a jump ahead of us every moment."

He stared out the vision plate at the sweep of land, at the trees and grass and sky.

"I wouldn't be surprised," he said, "if they figured out how to drive us off the ship."

A loudspeaker came to life and talked throughout the ship, so that everyone might hear.

Now hear this, it said, the old recording just a little scratchy. *Now hear this. You must leave the ship within the next twelve hours. At the expiration of that time a deadly gas will be released inside the ship.*

Jon reached out his hand to Mary.

"I was right," he said. "They planned it to the last. They're still that jump ahead of us."

They stood there, the two of them, thinking of those people who had planned so well, who had thought so far ahead, who had known the problems and had planned against them.

"Come on," he said. "Let's go."

"Jon."

"Yes."

"Can we have children now?"

"Yes," he said. "We can have children. Anyone who wishes may. On the ship there were so many of us. Now on this planet there are so few of us."

"There is room," said Mary. "Room to spare."

He unlocked the control room door, carefully looked it behind him. They went down the darkened corridors.

The loudspeaker took up again:

Now hear this. Now hear this. You must leave the ship . . .

Mary shrank against him and he felt the trembling of her body.

"Jon. Are we going out now? Are we going out?"

Frightened. Of course she was frightened.

He was frightened, too.

One does not slough off entirely the fears of generations even in the light of truth.

"Not right away," he said. "I've got to look for something."

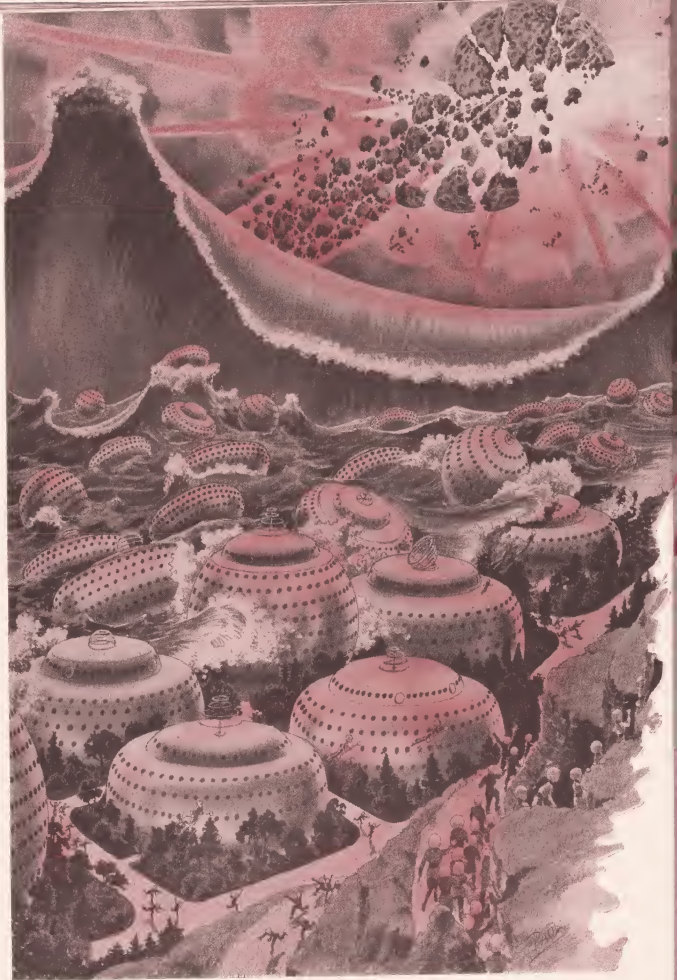
But the time would come when they would have to leave the ship, step out into the frightening vastness of the planet—naked and afraid and shorn of the security of the enclosing shell that could be theirs no longer.

But when that time came, he would know what to do.

He was sure he would.

For when the men of Earth had planned so well, they would not have failed in the final moment to have left a letter of instructions for the starting over.

+



As the moon, now only a few thousand miles away, is sheared apart by gravitational stresses, the waters of the Earth, which have been pulled into two great pools on opposite sides of the Earth, are released, and come thundering back toward the ocean and lake beds in tidal waves of tremendous height. Advanced man of this future period has constructed metal buildings that will float and not turn over, in an effort to survive the turmoil. Water-tight, doughnut-shaped buildings would be best for this purpose.



The end of the moon

by GUSTAV ALBRECHT, Ph.D., FRANK R. PAUL,
and DONALD H. MENZEL, Ph.D.

COVER ARTICLE

Frank R. Paul, renowned science and science-fiction illustrator, was given the assignment by SCIENCE-FICTION+ of depicting on the front and back covers the break-up of the moon. This was accomplished with the technical assistance of Donald H. Menzel, Ph.D. of Harvard College Observatory. Gustav Albrecht, Ph.D. was commissioned to ascertain scientifically when and how such an event was likely to occur and what the consequences would be. Everything in this article is based on sound scientific reasoning and not on surmise.

THE distance from the Earth to the moon has not always been the same, and it is still changing. Will the moon some day come crashing into the Earth? Or will we lose our moon to space? The ultimate fate of the moon is far more important to us than the fate of any distant star. If the moon should fall into the Earth we should certainly perish, and if we lose our moon we would also lose such phenomena as tides and eclipses.

Fortunately, science can answer these questions in surprising detail. The Earth-moon system presents one of the few problems of celestial mechanics for which our knowledge is sufficiently complete to give definite answers.¹

The moon is in fact receding from the Earth at about five inches per year, and will continue to recede for some billions of years, but at an ever decreasing rate. It will then return toward the Earth again.

We know from ancient eclipse records, from as

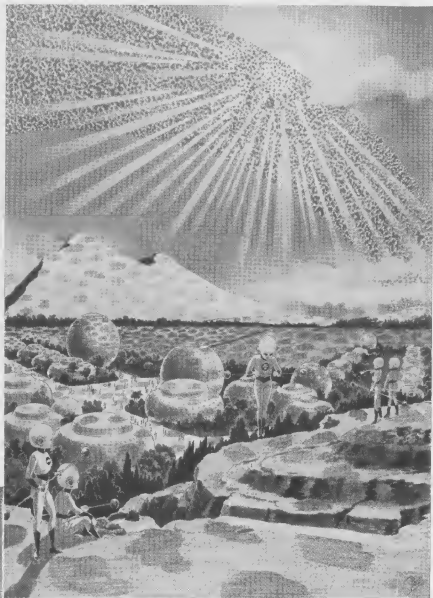
long ago as 40 centuries, that the length of our day is increasing. These ancient eclipses agree exactly as to the day with our calculations, but not as to the time of day, and they could not have occurred where they did, were the Earth not slowing down in its rotation. Calculations show that the increase in the length of the day amounts to 1/1,000 second per century. The reason for this is the tides, which are continuously pounding against the continents with an energy of 2,100 million horsepower, thus applying a braking force on the Earth. But how does this affect the moon? As the Earth slows down, the moon must move away from the Earth. This is a consequence of Newton's law of conservation of angular momentum,² and is confirmed by observations of the moon's shift among the fixed stars (5".8 per century observed as against 4".3 $\pm$.7 calculated), which agrees well with the evidence from ancient eclipses and the tidal braking of the Earth.

Before looking into the future, let us glance briefly

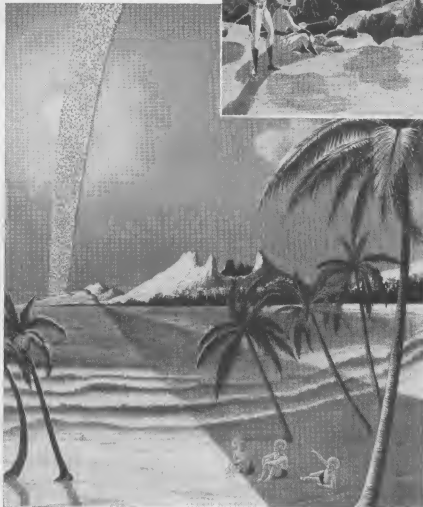
¹The classical calculations on the Earth-moon system were made by Sir George Darwin, son of the great biologist, and by Harold Jeffreys.

²See note on this law at end of article.

After the moon has broken up, its pieces will gravitate into an orbit around the Earth, forming a ring similar to that of Saturn. The humans who have survived the cataclysm will then rebuild their cities. Due to at least millions and possibly billions of years of development before this catastrophe, man will have evolved to a large headed, hairless state and probably attained a high degree of scientific advancement. Note, as the ring passes at the proper angle between the Earth and the sun, speckled shadow effects are cast on the landscape. These shadows would travel along the ground. Such a phenomenon would be especially common in the Earth's temperate zones.



At the equator, the ring around the Earth formed by the moon's fragments will display a narrower aspect—you see only the inside edge of the ring. When the sun strikes the ring, it will not throw shadows in blotches as in the temperate zones, but shadow will be solid. Wherever seen, the ring will present a glorious spectacle.



Gustav Albrecht, Ph.D.

Dr. Albrecht, although a member of the chemistry staff of Taft College is also an accomplished physicist. His figures were carefully checked at Mount Wilson Observatory, before release for publication.



Frank R. Paul

Although Frank R. Paul is a famed name in the science-fiction world, he is as well known as an architectural and mechanical draftsman, having designed the exterior of the famous Johnson & Johnson plant at New Brunswick, New Jersey.



Donald H. Menzel, Ph.D.

Dr. Menzel is the Acting Director of Harvard College Observatory. He was Assistant Astronomer, Lick Observatory; member Lick-Crocker Eclipse Expeditions, 1930, 1932; Director of Harvard-M.I.T. Eclipse Expedition 1936; three times winner of the A. Cressy Morrison Prize in science.





It has been suggested, by some scientists, that it might be possible to build rockets into the moon, and by the use of nuclear energy to drive it at a tangent to orbit, establishing a new orbit further out and staving off disaster for a great many millenniums. However, Dr. Menzel has calculated that a fabulous amount of energy would be needed to accomplish this feat, and that the chances were better that it might blow the moon apart, rather than push it out of its orbit. A desperate human race, might try it, and if the attempt were successful, the moon would be thrown into an elliptical orbit. A second blast at the furthest extremity of the ellipse would then be necessary to establish it in a circular orbit, so that the moon in process of completing an ellipse about the Earth would not return to the danger area from which it was propelled. Such an achievement, remains at best, highly conjectural at present.

into the past. If the moon is receding from the Earth it must once have been much closer than it is now.

Indeed, extrapolating into the past we find that it must have been nearly in contact with the Earth some 2 or 3 billion years ago. This figure is suggestive because it agrees roughly with independent calculations of the age of the Earth and the universe. However, the moon probably did not come from the Earth, but had a separate origin more than 10,000 miles from the Earth.³

At that time the day was little more than 5 hours long, and the month but a little more. Both moon and Earth were then inclined at perhaps only 12° to the Earth's orbit. When the moon in the course of time got to $\frac{1}{3}$ its present distance from the Earth, it solidified. Then its tidal bulge formed into what Jeffreys has called a "fossil tide" which is now responsible for the moon's keeping the same side toward the Earth.

The moon continued to recede from the Earth, until now, as everyone knows, we have a 24-hour day and a 27-day month. But as the moon continues to move away at 5 inches per year, the month will increase by $\frac{1}{8}$ second per century until the day and

³Gansow, in his recent book, *The Creation of the Universe*, believes the moon came from the present site of the Pacific Ocean, but Jeffreys and Harold Urey, to mention only two, disagree. It is interesting to note that two authorities in the field, Gansow and Urey, writing within the past year, disagree on this point.

the month become equal to 47 of our present days. This will require some billions of years.

Until now we have neglected a factor that will assume paramount importance in the destiny of the Earth-moon system, namely the sun, which also causes tides. To this point in our discussion the solar tidal effect has worked with the moon to slow down the Earth. As the solar braking effect continues, the length of the day will be still further increased, until the day will become longer than the month! The moon's tidal effect will tend to accelerate the Earth's rotation, and by the same law of conservation of angular momentum, will cause the moon to gradually return toward the Earth. This phenomenon will continue until the moon approaches the Earth so closely (a few thousand miles) that the Earth's tidal pull on the moon will break our satellite into pieces. (This is Roche's law which states that for a liquid satellite of the same density as its planet, the tidal force will break it when the satellite reaches a distance of 2.44 times the radius of the planet.)

This fragmentation of the moon will without doubt be the most dramatic part of the moon's long history. The long journey away from the Earth and back again through eons of time will be so slow as to be imperceptible in any generation of man (except perhaps to the generation of astronomers when total solar eclipses become impossible—and the later generation, on the moon's return trip, when they become possible again). But the final crackup of the moon will be a sudden and awe-inspiring event. Let us now imagine the conditions on the Earth before and after this catastrophe.

As the moon approaches the Earth through billions of years the tides will become gradually more severe. The present-day tides of a few feet will increase to hundreds of feet, and finally to miles—drawing the waters of the Earth into two great pools on opposite sides of the Earth in equatorial regions, but will leave the arctic and antarctic regions drained, and perhaps habitable.² Severe earthquakes will possibly be a constant occurrence. Perhaps mountains of great height will have formed, and may be habitable as islands. Certainly the Earth's continental outlines will be much different than they are now. As recently as the Cretaceous period, less than 100 million years ago, more than half of North America was under seas, so we could hardly expect the continents to be exactly the same even by ordinary geologic processes, in the course of billions of years.

The breakup of the moon into many small fragments occurs because of the difference between gravitational forces on the near and far sides of the moon. When the moon has returned close to the Earth where it again swings around in 5 hours, the far side of the moon "wants" to revolve in an orbit that takes about 9 percent or about 50 miles longer than the time required for the moon's center. Analogously, the near side of the moon "wants" to revolve faster than the center by about the same amount. As a result, the moon is subject to a shearing force along its orbit, a force that tends to stretch it

into an egg-shaped form. Finally, the gravitational shear between near and far sides becomes so great that the moon will split up, breaking into many fragments. Within a few days after the breakup, the jagged rocks that once formed the moon will have been spread out along the orbit—forming a sort of ring surrounding the Earth.

Very few of the rocky fragments will fall in toward the Earth. Most of them will swing in roughly circular paths about the center of the Earth, occasionally colliding with one another, causing further fragmentation until a narrow ring results, closely resembling that surrounding the planet Saturn.

Gradually, as this uniform ring is formed, the great tides on Earth will subside and almost disappear—and the oceans will again occupy the basins of the Earth. The tides from the sun will continue, but the days of the "great tides" will be past. The ring stage of the Earth-moon system should make for a placid time, with diffuse, almost shadowless moonlight every night and peculiar eclipses of the sun when the sun crosses the ring in the sky, partially eclipsing it, but reflecting brightly from the rest of the ring.

During this discussion it has been tacitly assumed that other things will remain as they are today. Considering that the time involved may be a billion or more years, this assumption is clearly not valid. For one thing, our sun is aging, too. Through the billions of years it may cool off considerably. As the Earth receives less and less energy from the sun, its climate will become constantly cooler. Also the sun will become more dim and the oceans of the Earth will freeze. Just when this will occur is uncertain, but when it does, ocean tides will cease and only the relatively small and almost frictionless atmospheric tides will remain to slow down the Earth—greatly retarding the moon's career as outlined above.

Let us also consider man as a factor in the picture. If within a short million years man could become absolute master over the plants and animals of the world, could he not in a billion years become master of his planet's destiny?

Advances in biochemistry will doubtless make man the master of his body, so that he can control its evolution to harder forms, and prolong life indefinitely.

And if the oceans freeze—by that time the experience of many ice ages—such as have repeatedly occurred in the recent past—will doubtless teach us how to cope with cold, perhaps by tapping the inner heat of the Earth itself closer to the dimming sun. Or, as an alternative, could we not move to another planet or artificial satellite when the moon was ready to break up, and return to the Earth later?

I would hesitate to put any limit on man's ability to manipulate his physical environment billions of years hence. However, if the sun, in the course of the ages, should turn into a nova and explode, then mankind will certainly be utterly destroyed within minutes of the celestial atomic explosion—unless the astronomers of that age had calculated the sun's end and led the Earth's population to security on another solar system. +

Note on the law of conservation of angular momentum.

The law of conservation of angular momentum, so important in the above discussion of the Earth-moon system, is also of great importance in Earthly affairs. Cyclones, trade winds, and ocean currents are largely determined by the effect of this law, and it must be taken into account when firing large shells north or south. Not people go through life never aware of this law, and still it is possible to observe the effect by a simple experiment as follows.

Holding some heavy object in each hand, and with arms extended fully, spin on the sole of one foot on a smooth floor. While spinning, quickly pull the hands in toward the body. Your rate of spin will increase markedly, and you will probably lose your balance, but by rapidly extending your hands again you will slow down.

The law of conservation of angular momentum states that $m r^2 \omega = \text{a constant amount}$ where m is mass, r is the radius of the circle, and ω is the rate of rotation. To keep the product $m r^2 \omega$ constant it was necessary for "w." the rate of rotation, to increase. The mass " m " remains constant, of course. Dancers utilize this principle in making pirouettes.

¹As to the solar braking action, the Earth will slow down still further until finally it keeps one face turned toward the sun. Then the Earth will start to spin backward, rotating from east to west (clockwise). The sun, the moon, and the stars will rise in the west and set in the east. During this phase, the tides will tend to speed up the Earth's rotation and the moon, receiving angular momentum as before, will draw in toward the Earth, a process that will continue until the moon comes within a few thousand miles of the Earth's surface. Then the Earth's tidal pull will disintegrate the moon.

²Within a few hours after fragmentation starts, the giant tides will begin to subside. Within a few days the moon fragments will be so spread out over its orbit that no major tidal effect will occur except in the equatorial plane. The rings will still draw water away from the poles, leaving them free from oceans of any great depth. The equatorial region will be covered with water more deeply than now, but the high lands will still stand out.



book reviews



Perpetual Cadenza

THE DEMOLISHED MAN, by Alfred Bester. Shasta Publishers, Chicago, 1953. 250 pages. \$3.00.

In recent years, some leading science-fiction magazine editors have taken the view that there is little that is new or original left in science-fiction and that the only way for progress in the genre was to



Alfred Bester

place the emphasis on what the critics are wont to call "arch" writing. The favorable result is that many science-fiction stories have found their way into anthologies and obtained for the field greater literary recognition than had formerly been accorded it, but this has been offset by the gradual loss of strong central ideas and plotting to a point where, by analogy, the clothes will not only have to make the man, but hold him upright as well!

This novel represents the ultimate achieved to date in that particular direction of science-fiction. Alfred Bester, an experienced radio script writer, pulls off every gimmick in a writer's repertory and even invents a few never seen before. He goes a step further and employs trick typesetting for special effects. The result is a completely different and effective science-fiction novel. In its direction it is good enough to discourage wise writers from exploring this vein any further. It is unlikely that they will be able to do better than Bester, and when an entire story must stand or fall by its writing, only the best is acceptable.

Although the plot when recited sounds asinine, and the pace and special-effects

slacken somewhat at about the halfway mark, this book is nevertheless an important experimental in the evolution of science-fiction writing.

Tomorrow is Upon Us

PREVIEW FOR TOMORROW, by Bruce Bliven. Alfred A. Knopf, N. Y., 1953. 345 pages. \$5.00.

This factual book is subtitled *The Unfinished Business of Science*, and it is beyond question one of the most provocative, lucid, and worthwhile books of its type ever to appear.

The author, long an outstanding science writer, examines the findings of hundreds of scientists on scientific problems which face us at this moment and which could be solved within our lifetimes. One of the most fascinating chapters in the book is entitled "The Conservation of Intelligence." This chapter presents factual investigations that indicate that only 50% of the highly gifted individuals in this country receive the education or opportunity to exploit their potentialities. Bliven's discussions of the nature and characteristics of intelligence are the highlight of the book. Only a little less interesting are the chapters on rainmaking, atom-powered engines, solar furnaces, and numerous other subjects.

As a discussion of the near future, predicated upon the known facts of today, this book is most highly recommended.

Small Fry

CHILDREN OF WONDER, edited by William Tenn. Simon and Schuster, N. Y., 1953. 336 pages. \$2.95.

So numerous have science-fiction and fantasy anthologies become, that they have reached the point, where, as with this one (which is entirely composed of tales about children), finding a reason for its

publication is often a tough proposition. William Tenn is the pen name of Philip Klass, and within his limitations he has allowed himself the utmost latitude choosing science-fiction, fantasy, weird, and horror stories about children, as well as combining leading literary lights with well-known science-fiction names. As a result he has obtained a good level of writing. The more outstanding stories in the volume include "In Hiding," by Wilmar H. Shiras; "Born of Man and Women," by Richard Matheson; "That Only a Mother," by Judith Merrill; and "The Words of Guru," by Cyril Kornbluth.

Another Collection

FUTURE TENSE, edited by Kendall Foster Crossen. Greenberg Publishers, N. Y., 1952. 364 pages. \$3.50.

In this science-fiction anthology, editor Crossen has divided the contents between reprints and new stories.

While readable, the collection is quite undistinguished, the brightest light being one of C. L. Moore's early fantasies, "Scarlet Dream," which still engenders in the reviewer some of the color that gave C. L. Moore her early reputation.

Popular Science Magazine

ISLANDS IN THE SKY, by Arthur C. Clark. *Popular Science Monthly*, June, 1953. 25¢.

For the first time in its 81-year history, *Popular Science Monthly* publishes a science-fiction book condensation in addition to its regular features and departments. Appearing as a special 20-page insert in the June issue (now on sale) is Arthur C. Clarke's *Islands In The Sky*, a novel dealing with space stations that permanently circle Earth. The cover sports a full-color illustration by Ren Wicks.

Stranger
than O
Science-
fiction

PSYCHOLOGICAL GADGETS

Hearing Aid

IN OUR technological radio-electronic age, humans become conditioned to their surrounding gadgets far more than they commonly believe. Two examples elucidate this. Eugene McDonald, President of the Zenith Radio Corporation of Chicago, some years ago, before he began manufacturing electronic hearing aids, attached a shoe string to a black, hollow wooden bottom. He placed the plug in his ear, letting the shoe string dangle free. Strangers who came to his office thought that McDonald was wearing a hearing aid and automatically raised their voices so he would hear better. The piece of wood and shoe string thus became a psychological hearing aid.



Taxi Heater

IN New York City, most of the taxicabs are equipped with two heating outlets, one near each door. Riders sitting near the right door feel a hot blast coming from the right grille and assume that heat also comes from the left heater opening. The latter, however, is a dummy. Without it, the riders would feel that only half of the back part of the cab was heated. (Actually, the air from the single outlet circulates sufficiently to warm the cab.)

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BOLIVAR rested the nozzle and hose connected to the insecticide cylinder on the bright, blue-green grass. He raised his head and gazed at the sky as he wiped the sweat from his brow with the sleeve of the synthetic silk shirt he wore; it was an all-purpose material, easy to produce and marvelously long-wearing.

A short distance away, Gus stopped too, and the acrid, blinding fumes of the chemical swirled about them as it was dispersed by a slight breeze which gently swayed the stand of chestnut-like trees in the background.

"So we've sterilized this section," Gus grinned, as he spat with accuracy at an inch-long variegated worm which had been laboriously crawling toward him. The strong tobacco juice stopped the insect in its track; it writhed, curled and lay still.

"It'll stay lousy for a week." Bolivar stooped down and began to coil nozzle and hose, then carried it back to the portable cylinder.

From the clump of trees, the sound of a gong reverberated through the vast stillness. After the overcrowded cacaphony of Earth, this virgin world, with its immense desolate expanses and primeval silence, was something they had not become accustomed to.

But this planet had its compensations. No one could suffer from claustrophobia here; the silence would eventually be conquered by the beneficial insects and harmless birds which the government of Terra had provided.

In any event, although they were in a sense outcasts, no criminal stigma had been attached to the order for their relocation.

The surging billions of Terra had achieved a delicate balance where excesses—even emotional ones—could not be tolerated. It was too dangerous to allow uncontrollable psychological factors to alter established patterns.

The two thousand families which had finally been relocated on the deserted planet had been carefully screened for precisely those factors which in the dim past had been considered virtues, but which in the highly sophisticated and regimented Terran social order, were considered dangerous survivals from another age.

In short, although the word was never used, they were classified as Class A atavisms.

When Bolivar arrived at the plastic prefabricated dwelling which was his home, Stella had supper on the table. He kissed her warmly, tenderly, for the wonder and ecstasy of their honeymoon still lingered, touching even the loneliness of this new world with the miracle of its happiness.

It was a simple, frugal meal of Terran vegetables and proteins which had the taste and texture of flesh. They had to be frugal. The newly planted crops and grains had yet to germinate and be harvested; the dairy and food animals must be preserved until their multiplication would reach the point where their consumption was feasible.

And the spaceship which had brought them, along with all the imperatives for colonization had gone, its dwindling fire becoming a shooting star in the heavens and finally disappearing in the endless void. It left behind a world of loneliness, but not before it had given these strong, resourceful Terrans the incentive of creating a new world. The crew of the spaceship might have spared itself the twinges of conscience they had felt on leaving the colonists behind.

They didn't quite understand, on viewing the desolate expanse of the new planet, that its very primitive

Ultimate

by ALBERT de PINA and HENRY HASSE

grandeur had not only provided the colonists with a creative challenge—a new incentive—but with something more which belonged in all truth to another age.

Bolivar sat down at the table and smiled whimsically at the way Stella had managed to find blue flowers in the forests to decorate the table.

He gazed at her and for a moment it seemed to him as if he were viewing the future, when their plastic home would be alive with children. The long afternoons would resound the lowing of cattle. There would be birds nesting in the trees, endlessly bickering, or soaring in streams of song. And the fields, golden with ripening grain, would sweep in shining waves to the very shores of the one placid ocean.

He remembered his last year on Earth. The stifling monotony of his days as a minor agricultural engineer. Stifled by the sameness which condemned him with millions of others to a changeless security which allowed for no promotion just as it regarded as unthinkable any retrogression. The miniscule alcove which served as his home; the rigidly rationed food, clothing, and necessities—and the crowds, always the inescapable tidal wave of humanity which suffocated every moment of his life.

"Dreaming of Earth?" Stella inquired gently, and there was a nostalgic expression in her eyes.

He shook his head and smiled. "No, my dear. I was dreaming of what our new world will be like. Think of it, we can literally build a world to our heart's desire. We'll be not only existing, like on Earth, but living and growing!"

THEY BEGAN to eat, wrapped in the silence of the lengthening shadows, as the pale yellow sun sank into the calm blue waters.

"I'll be glad when you've finished sterilizing," Stella spoke. "We might have a garden of our own. It's a wonderful feeling to see growing things. On Earth, all I ever saw from the windows of the hospital where I worked were the rearing buildings, and the gray-black pavements." She laughed happily. "I've never even seen a garden. May I have one now?"

Bolivar smiled tenderly. Flowers, fragile things all beauty and color. On Earth only eating things could be grown. But here, a whole planet awaited a new rebirth—the song of birds; the travail of the harvests; and for the first time the sound of laughter.

"Won't be long now, this whole sector will be cleared of those stubborn pests. The more we try to sterilize, the deeper they burrow into the ground. It's uncanny the way they put up subsurface defenses. One would think they had human intelligence!"

"Is it so critical?" Stella inquired innocently.

Bolivar shrugged. "It is, if we're to be sure of having crops. They're like politicians . . . undermining everything. This world's like a door to life, Stella. We can't risk having it closed on us."

Life

People tend to think of things in the terms of the familiar. When a layman speaks of "life on other worlds" he actually means something recognizably human. But the facts indicate that intelligence in one form or another may be found everywhere. The humble ant has a complex social structure, including extreme specialization of types for certain functions; it tends its "milk-producing cattle" and even organizes and conducts real wars. Yet no beginning has been made by man at communicating with the ants. Our chances of recognizing intelligent life on another world, particularly in alien guise, is remote. Our chances of communicating with them are fainter still. An intergalactic alien, then, might be forgiven if he needed a lot of convincing before he was certain that man fulfilled his own definition of intelligence.



Henry Hasse

Henry Hasse started out as most science-fiction writers today, as an avid science-fiction fan. Sold his first stories while in high-school. He is primarily noted for his anthologized short novel, *He Who Struck*, and his hilarious burlesques, *The End and Return of Tyme*. He collaborated with Ray Bradbury on that famed author's first tale!

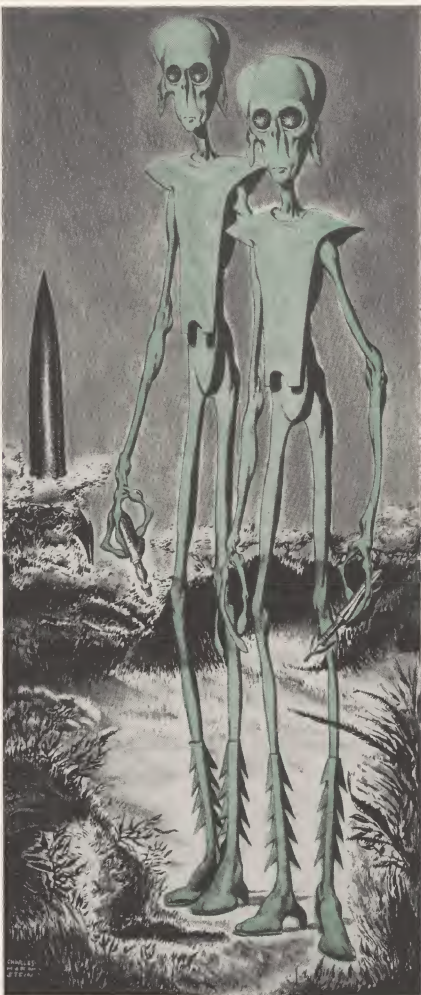
Albert de Fina

Noted traveler, author, lecturer, novelist, and screenplay writer. His essays, stories, and articles have appeared in five languages. His latest book is *The Gellions*, a biography of Jesus.



"Varona had kicked over a large clod of soil, revealing a subsurface chamber."

(Illustrations by Charles Hornstein)



The Genserians

IT HAD been eons since their lives had been ruled by self-interest, passions, or sentiment.

They were a race so old that all the changes of passion, heartbreak, and adventure had been wrung from their souls.

Only loneliness remained.

Among the thousands—millions, even—of stars, theirs had given birth to a planet that bore life. And that life was their race. The irony was that except for them, their galaxy was sterile. So they thought!

Alone, in their own eternity of space, they had gradually passed through all the stages of savagery, barbarism, wars, and finally the beginnings of true civilization. But all of that had been immeasurable ages ago, until even the memory of past wars had ceased to be a legend, and the legends themselves had grown dim and ceased to exist.

Throughout millenia, conflict among themselves had become impossible, and violence an impossible psychological aberration. Even science had ceased to be an adventure.

At first, as the virus of their galactic boredom became more and more intense, their starships roamed the limitless reaches of their galaxy, searching, always searching for some form of life that might offer the kinship of intelligence. But it was the irony of their destiny that among the thousands of stars and their planetary systems, the only forms of life they had found were either so brutish and bestial, or so utterly alien, that not even their extraordinary science could hasten their evolution toward intelligence.

The Genserians were fated, it seemed, to an eternity of killing time instead of employing it creatively as the very substance of life lived to its fullest.

More and more their life had become devoid of wonder. Steeped in melancholy and lacking incentive, it had become a grey transition between birth and extinction. Little by little their literature, their magnificent arts—even their music—began to sink into the background and to disappear along with innumerable variations of pleasure they had long since invented.

They could not even pass on to a younger race the treasury of inventions and discoveries which enriched their world. Thus they were denied that final meaning which lies in parenthood—galactic parenthood was their lot.

And then, in one of those scout trips to the limits of their galaxy—more to commune with the eternal melancholy silence of space than anything else—they had discovered the planet Rima. It had suited their mood, for it was desolate like their minds—barren of intelligent life like their galaxy. And yet, like a nostalgic reminder of their ancient dreams, it was verdant and aglow with the golden wash of a beneficent sun.

Varona had commanded the scout ship. The crew, which was not a crew—for any of its members could have filled any position on the ship except one—had kept up the illusion of its being a flight of exploration. They were all aware, of course, that it would be as sterile as previous ones. So that when they landed, it was more to break the monotony of space flight, than to try to confirm any possible hope.

For a moment, as they first breathed the clean fragrant air, and trod fastidiously on the lush grass, something of the very primitiveness of the uninhabited planet seemed to touch them. They even speculated what it would be like to begin all over again

in this new world, and build it anew. And then they saw the futility of such an idea. They had become too utterly removed from the realities of pioneering.

They stood silent, their ten-foot-tall incredibly thin and fragile bodies slightly translucent, scarcely casting a shadow on the blue-green turf. There were no signs of life. And then, Varona had kicked over a large clod of soil, revealing the small mouth of a subsurface chamber.

There was life! But to their chagrin, so inconceivably non-Gensarian that they did not even betray their thought-processes. Whatever the fundamental structure of their minds was, there seemed to be no way of contacting them. But it was intelligent life, there could be no question about that!

To the Genserians, it became an enormous incentive. Here was a challenge, and a promise, and a confirmation of their hopes.

These subsurface dwellers of a primitive planet, whose soft white bodies were not more than an inch long, became all of a sudden the center of attention of Gensarian culture. Scientists theorized and even argued for the first time in thousands of orbitemps* concerning the aliens' social structure; for they had one!

They had vastly more than that, in the complex yet rigid matriarchy which ruled their dark world. It was discovered that they had evolved a complicated, yet utterly functional type of architecture; their social classes, which included the workers, warriors, and matriarchs, were born of identical eggs hatched in an identical way, but organically modified by miracles of diet.

One Gensarian scientist had earned the highest honor, and what was more, the gratitude of his world, by discovering that these aliens not only were capable of flight, but once an orbitemp performed a dramatic ritual of mating and death in midflight! Another discovered their telepathic means of communication, and that they had a system of husbandry and even suffered parasites to find shelter in their cities—and that they had pets.

This last finding brought the aliens a little closer to the Genserians, for they themselves sheltered and protected huge quadruped pets, hairy, long-toothed, and fierce but completely loyal and devoted animals of a very low order of intelligence, which they called *savjers*.

But centuries of investigation, experiments, and efforts to bridge the abyss that separated them from the subsurface inhabitants of Rima, had been unavailing.

The tiny Rimans remained as alien as ever. And thus, another great hope had finally dwindled and died. So reluctant were the Genserians to give up even this forlorn hope, that it was decided to wait five centorbitemps before visiting them again, in the hope that evolution might make them more accessible.

FOR hundreds of orbitemps, the problem presented by the Rimans had kept alive speculative science and had given a new impetus to exploration, in the hope of finding other worlds with intelligent life. And now, the date of the return to Rima had come.

There was a touch of excitement in the rarified atmosphere of the Gensarian minds. They were all scientists. All of them were convinced that this trip would bring no greater results than the previous ones. And yet, some stubborn hope that refused to die, brought back to life the forgotten and faint memory of ancient emotions.

*An orbitemp (pl. orbitemps, or orbitemps) is the time measure it takes for a given planet to make one revolution around its sun.

They clustered around Varona in the control room, as he powered the screen to full magnification, and into the field of their vision a solitary planet floated slowly, touching with shadow the golden glare of the alien sun. They had seen it happen a hundred thousand times, and yet it always stirred them a little.

The patrol ship flashed over the planet's pole, then swung in a parabolic arc toward the southern hemisphere. Varona brought the ship in silently, and landed it within two hundred yards of where originally he had made the epochal discovery.

Soon they had all left the ship, and let their huge *sawjers* run and romp and chase imaginary shadows in the warm invigorating sun; attenuated as their physical reactions were, they could not but feel the indescribable sensation of this burgeoning and fertile soil, with its young jungles and unsullied virginity. They breathed deeply of the fresh dew-laden air, and watched whimsically for a moment as Perra, Varona's pet female *sawjer*, snarled at her mate and romped away into a field of golden grain.

Strange, Varona thought inwardly, *I never noticed a field of grain before. Could it have evolved from primitive grasses in a mere five centorbitemps?* And then it occurred to him how long he had lived, and that in another couple of hundred years or so rejuvenation therapy would not work any longer.

Suddenly he hoped with an intensity that startled him, that they might be able to contact these alien intelligences, that he might take with him into oblivion the memory of success.

But he had no more time for idle speculation. At the far end of the field Perra's casual barking had suddenly become an ominous growl; then there was a series of snarls, and a voice tinged with fear.

The tremendous outpouring of emotional energy struck them telepathically like a blast. They had never experienced signals of that kind! They hurried toward the point of disturbance.

They found Perra in mortal combat with a strange biped, slightly less than two-thirds their size. The creature, whatever it was, had a curling mat of black fur on its head, beneath which two luminous grey eyes were wide with fear and rage. They thrashed

violently among the golden grain. As the Genserians stood transfixed, buffeted by the maelstrom of primitive emotions, they were even more astonished to see a smaller and slighter replica of the creature, with yellow fur on its head, come flying from among the trees and join the death struggle.

They saw the larger of the two creatures raise one of its powerful appendages on which something metallic gleamed, and plunge it into Perra's body.

Perra slid to the ground with a howl of pain.

They stood facing each other across the crimson-stained grasses of an alien world. They stared at each other in the silence of absolute astonishment.

None of the Genserians had ever witnessed a kill. They were too numb and startled to feel horror; they could only gaze at these savage creatures, and blank their minds against the barrage of psychic vibrations.

Varona recovered first. He had been trying to send powerful telepathic thought-patterns to the creatures. But they seemed utterly incapable of receiving them.

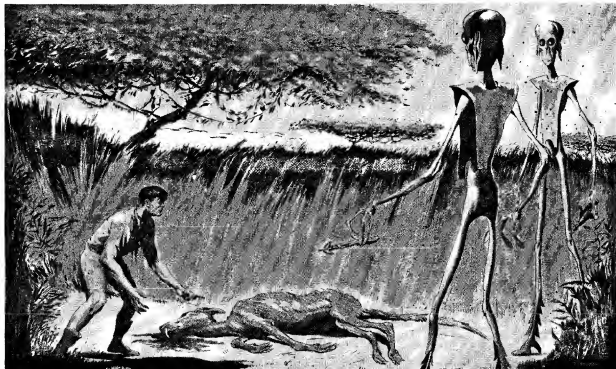
He wondered with a sense of futility if the strange and alien planet could only produce such un-Genserian types of intelligence that it was useless even to try to contact them. The first life-form had proven a complete failure. These, although a travesty of their own physical appearance, seemed even lower in the intelligence scale than the wormlike matriarchs who lived beneath the surface crust. They were dangerous, too! He suddenly realized.

Wordlessly he aimed a tiny conical rod, first at the larger creature, then at what was evidently its female. They toppled over without a sound, as the charge painlessly neutralized them.

It took the entire crew of seventeen scientists to carry the two heavy creatures, one at a time, to their ship. Once there, they held a conference.

Some of the scientists were for taking them back to their own world. Varona himself was dubious. He felt they were violating their captives' rights.

"... Besides, what good would it do? We must study them in their own *milieu*—against the background of the environment which produced them!" Varona observed placidly.



"They stood facing each other across the crimson-stained grass..."

"But did Rima produce them?" Garaban, the psycho-synthesist wanted to know. "In a mere five hundred years? Granted, their intelligence seems to be of a very low order. It has to be, for this creature to engage in mortal combat with anything as fierce and elemental as Perra!"

"Then too," Moldav, the para-psychic, observed thoughtfully, "I noticed right after the battle that the female was having a violent neuro-emotive upheaval. These are low order, highly unstable primitive intelligences—in fact, the original matriarchal race had a vaster, more stable type of co-ordinates. Witness their highly evolved social complex; their advanced architecture and underground agriculture. And most important, I think," he ended, "they are sufficiently evolved as to be incapable of attack."

"They were," Vestal interposed. "While you conferred I have been exploring in order to establish the incidence of these creatures. There seem to be no others in this sector. But, the startling fact is, that the original matriarchs have been destroyed by some sort of lethal gases, artificially introduced into their subsurface cities!"

The disclosure caused as near a sensation as the nature of the Gensarians permitted. They gazed at one another in something akin to horror.

What were these newer creatures? They seemed to have a genius for destruction. These low-order, non-telepathic bipeds seemed to be the embodiment of explosive violence. Varona felt a long forgotten thrill of anticipation. Here was not only a problem as to origin and identity, but something far greater. All this energy, all this incredible emotional power, could not possibly be the complement of a mere brutish, bestial biped. He struggled to recapture some of the ancient, atrophied passions which his race must have felt in eons past. He failed. With a sigh, he turned gently to Garaban. "Do you suppose that by some miracle these creatures possess a share of the insight that might lift them eventually above the level of, let us say, our pet savjers?" He patted the enormous fanged head of Porro, who had lain his muzzle on Varona's knee. Porro lifted his great eyes and gazed mournfully and adoringly at his master, and gave a gusty sigh. He missed Perra, his mate, and the young female they had given him taxed his patience.

One of the younger scientists brought a large platter of food and placed it before him. The shaggy head sniffed the succulent proteinates disdainfully, and turned to gaze at its master. Mara, his young new mate, came rushing in and started to take a bite from the platter. Instantly, Porro turned with a gargantuan snarl, bearing his sharp white fangs, and crouched for the attack. Mara hesitated briefly, drew back, and with a low growl retreated. Porro stood over the platter of food and glared at her.

Varona wearily gestured towards Porro. "They never change, you see! After endless millennia and countless generations, we have failed to raise them an iota on the road to evolution!"

Moldav nodded gently. "Sometimes I think," he said, "that we're trying to find something which does not exist. We're chasing phantoms—it's a deep subconscious wishfulfillment, which in some way is tied up with our fear of racial extinction."

Garaban smiled. "We have lived so long, we have all become rulers—but we have no one to pass the power to. I would be the last one to dash your hopes. But my theory is that these creatures are rebel parasites who have turned against their hosts, the

matriarchs, and emerged from the subsurface cities. Obviously, they could not have been evolved in five hundred years. More obviously still, they could not have come from space!"

VARONA rose, and went into the interior of their ship. He stood before two hastily converted staterooms. Originally they had been doorless. Now they were barred with thin strips of alloy. The two strange creatures had been placed one in each stateroom. They were awake now.

Varona had hardly been there a moment before the larger of the two specimens took the vessel containing water, which had been placed inside the stateroom, and hurled it out, missing Varona by inches but nevertheless drenching him.

He stood there utterly astonished. While the creature uttered a rapid succession of discordant sounds, and shook the alloy strips with almost supernatural strength.

In the other stateroom, the yellow-furred female buried her face in her hands and emitted curious muffled cries as her shoulders shook convulsively.

After a while, the neuro-tempest subsided. But the male continued to glare at him with an awful fixity of purpose. It was then Varona noticed the creature had in his hand the noncorrosive alloy math-temporal rule he had lost, five centuries before.

He smiled. He wondered with faint amusement if such an occasion had ever occurred before. It was as if Porro, his pet savjer, were to take up in his paws a slide-rule.

As he stood observing the amazing creatures, Garaban and Moldav joined him.

Little by little, the rage of the male seemed to subside. He was emitting strange sounds now, and to their infinitely subtler minds it seemed as if there were a terrible desperate urgency in the deep voice.

"Do you suppose these creatures have a language of sorts?" Varona wondered aloud.

"Of course. Rudimentary, no doubt, but so has Porro here." He patted the bristling savjer who had followed the scientists silently. "No matter how low the order of intelligence, all life beyond a certain stage has means of communication—it may be vocal, as in this instance, or telepathic, as in the case of the matriarchs. Perhaps both, as in our case." He shook his head with vast disappointment.

"I would give my last remaining two hundred orbitemps," Varona said with conviction, "if I could only find the merest evidence of that spark which is the key to creative evolution in even this creature!"

"What do you imagine he sees of interest in that math-rule?" Garaban inquired half in earnest, half in amusement. "What an adventure to be able to penetrate his mind for even a few seconds!"

They fell silent. The two aliens were quiet now, as if from the depth of their vast despair they gazed at their captors, beyond fear and beyond words.

And out of the silence Moldav, the para-psychic, spoke. His voice rose, tinged with the faintest excitement. He had always been the most original.

"I think," he said uncertainly, "that perhaps we are defeating our purposes by trying to solve this problem from our own exalted point of view. We have become so far removed from the basic values of life that we no longer seem able to understand, not only the problems, but even to recognize the signposts! Observe. See how the family is desperate to be reunited with her mate. Does it not mean something to you, this powerful attachment, even under the stress of an artificial environment?"

They turned to gaze at him in astonishment. If they understood correctly what Moldav was trying to hint, these were low-intelligence beings—precursors of what might be one day, a culture comparable to theirs. This they had gathered from his mind.

Garaban, the psycho-synthesist, permitted himself a slightly sardonic smile. "Even Porro has an attachment of sorts for his females," he observed mildly. "The most bestial lower form will fight to the death to protect its young. These, my dear Moldav, are mere instinctive reactions. I am surprised that one of your brilliance and originality should entertain such mistaken deductions from primitive behavior!"

Varona raised his hand. As the eldest, he permitted himself certain prerogatives, and his whimsical mind had suddenly conceived a simple test which would once and for all settle all theories and speculations.

"My dear Moldav, we have lost so much, so very much, that even the thrill of scientific and intellectual speculations has vanished. It was the last remaining type of adventure we had—we no longer have that. Since we seem to have become so emotionally rarified, that in comparison with these," he gestured toward Bolivar and Stella, "we are but a shadow of life; I wonder you would endow these creatures with the only remaining reason for existence that we possess. Surely, only after having tasted the bitterness of defeat, endless humiliations, unimaginable despair, were we able to rise to our present stature and understand the length and breadth and depth and height of the noblest, the only supreme emotion left to us. And that you should hint these creatures can even begin to be capable of it..."

Varona had the unprecedented and pleasurable feeling of being speechless for the first time in his life.

But Moldav held his ground. It was a challenge. If only for this, the Gensierians' flight into space had been a success. "I can prove it," he said quietly.

"It will be cruel," Varona thought aloud, having read Moldav's mind.

"It will not harm them, however," Garaban interposed quickly, catching their trend of thought.

"How long shall we time the experiment?" Moldav inquired, as he eyed the alien creatures.

Varona gazed at them speculatively. "I should say that sixty divisions of time would be about right. If there is any danger during the experiment, we can always stop. Given their anthropological make-up, they should be susceptible to our rejuvenation process in case of physical damage."

And suddenly, despite the obvious absurdity, all three of them hoped with all their beings that the experiment would be a success.

TO BOLIVAR and Stella, the whole thing had been a tremendous shock. Bolivar had tried the three or four languages he knew on their captors, without success.

The very uncertainty, their complete ignorance of the fate in store for them, added to their fear and horror of the unknown.

He tried to reassure the hysterical Stella, repeating over and over, "Nothing's going to happen, my dear. They're just curious!" But he himself didn't believe it in his heart.

"But who are they? What are they trying to do to us?" Stella sobbed. She felt her senses reeling. The sight of the tall, attenuated beings whose large eyes regarded her so intently, paralyzed her reason.

Bolivar tried to explain, "They're from out in space somewhere, darling—probably millions of years

ahead of us in development. And they're testing us. They don't quite know what we are, just as we wonder about them. But there's no danger!" He reassured her trying to put conviction in his voice. Stella sobbed.

That night Moldav who was on watch, came and stood silently before the two barred state-rooms. He seemed to be concentrating as he regarded Bolivar and then Stella by turns.

Bolivar took the math-rule and moved it back and forth; he could not hope to understand its strange mathematical symbolism, but he tried desperately to show Moldav that he understood its purpose. The Gensierian remained impassive and aloof.

In desperation, Bolivar concentrated on their new home on Rima, on Gus and his family living a few miles away; on Earth and its surging throngs, and mammoth cities—he concentrated until his head ached and his eyes burned.

For an instant Moldav's eyes glowed, then he smiled and left as silently as he had come.

The next day, the food ration stopped.

Stella and Bolivar didn't know what to think. They had never brought courage to life or to love—on Terra, it was not necessary. Their rigid, paternalistic culture frowned on greatness. The slightest deviation—even daring or great love, not to speak of abnegation—were considered proper subjects for psychiatric study.

They had no weapons left but themselves; no resources but the vast heritage of their race, now dormant and stifled by the cowardly soporific of an artificial way of life.

But they were the unwanted. They did not quite conform to Terra's sterile ideal. Were they not atavistic? For that they had been *relocated*—a polite euphemism for exile. And now, in their hour of need, it was their very failure which came to their aid!

The days lengthened into a week, and still no food was forthcoming. Stella and Bolivar had passed through the agony of hunger and into the grey chiaroscuro of semicoma. Daily they grew weaker. They had dreamed of feasts and banquets as they tossed restlessly and cried out in the night. But now, even the mocking specter of hunger had gone, leaving their minds preternaturally clear.

They knew that some fiendish test was under way. And they no longer hoped that their captors possessed any decency. At times they lapsed into delirium, losing their sense of reality as the subconscious overflow gave them relief from tortured nerves and endless fear. Phantoms and nightmares invaded their minds with distorted dreams and memories of Earth and Rima, only to awaken to the reality of starvation—made more stark and terrible by the increasing clarity of their minds.

The Test

IT SEEMED to Bolivar as if here in the glaucous depths of Rima's placid ocean there was silence and peace.

He felt cool and relaxed in the luxury of an all-pervading lassitude. Only a faint memory of a "she" with yellow hair gnawed subtly at his mind; it was a vague remembrance that had to do with waving fields of grain like a golden sea. And the "she" was part of him—but he didn't quite know how. And then he was stooping over the freshly furrowed earth, to pick up a strange metallic instrument with odd symbols, which he could not understand out of its frame of reference. It looked like a super-slide-rule.

He floated in that placid sea, shielded by the warm

darkness, weightless—in an ecstasy of non-feeling, scarcely breathing. Suddenly, he was flooded with light, and he felt himself rising, rising upwards until he broke surface and awoke to a universe of pain. His eyes were blurred, and delirium returned to dance a macabre saraband without meaning in his brain.

As if from a long distance he saw the fading outlines of his captors; their figures seemed to waver, recede and grow dim. He could hear strange voices pitched low, but the sounds had no significance. He felt a vague irritation at the figures and the lights and the sounds; he longed for the warm security of his placid sea. And without knowing it, he whimpered.

"We have gone too far!" Varona protested. During the weeks of the experiment, he had begun to feel the stirrings of emotions he had not known he was capable of. It made him uncomfortable. "We have no right to violate the concepts of our ethics."

"But you concurred in the experiment," Garaban softly reminded him. He, too, seemed haggard.

But it was Moldav who was not quite himself. He made a gesture with his hand . . . it trembled.

"I would have stopped it long ago," he said pensively, and purposely left his mind open for contact. "But I seemed to contact mental vibrations from the male. Strange! Something in the form of images he was trying to project. I decided then to go on with the experiment."

The other Genserian scientists gazed at him in mild astonishment, probing at Moldav's mind.

"But that would presuppose a high order of intelligence!" Garaban exclaimed with a measure of intensity such as he had rarely shown. "It would mean our search is at an end!"

Moldav nodded. "I am not quite sure," he said slowly. "If I am right, the final test will reveal it."

"I still think it's unfair," Varona shook his head incredulously. "Oh, they're biped, and therefore startlingly Genseroid, all right. Some of the indices conform to our highest expectations, such as cranial development and especially . . ." He broke off uncertainly and frowned at Moldav. "The tailless, hairy, stoop-walking caricatures of Rigel-VI had similar characteristics, remember? There we drew a blank."

Moldav remembered. It had been one of their greatest disappointments. The strain he was under was beginning to give his fragile features an elfin look.

At that moment, one of the younger scientists came bearing aloft a steaming platter of food. Silently he placed it before the two staterooms, far enough back as to be clearly visible by both captives.

Slowly the passageway became filled with the rest of the crew. There was no sound except their shallow breathing, as the succulent odor of the food permeated the air.

And then Varona did a strange thing, he placed a hand on Moldav's shoulder, and his thoughts had a tinge of compassion.

"Don't be affected by the failure of this experiment," he said softly. "After all, remember that the instinct of self-preservation is supreme among all the creatures we have ever known. In all recorded history, we've never encountered abnegation—except among ourselves!" He touched an activating key to the lock on each barred door, and silently they slid back in their grooves.

The overpowering odor of food awoke her. Stella stirred and opened her eyes; so weak she could scarcely move, she stared at the white metal ceiling of her cell. Wave upon wave of maddening odor assaulted her. She trembled with the intensity of her desire as her mind cleared.

She turned her head slowly towards the source of the heady fragrance, and saw the platter of food. For an instant, her mind clouded, and she knew only a ravening urge to devour it. She glanced up and saw the tall figures of the aliens as they watched her, and her lips drew back tight over her teeth. Then sanity returned. Her mind had never been so clear. It was as if her famished and wasted body had released its hold upon her mental faculties, and there were no barriers to her understanding.

Intuitively she knew. *This was the test!* She gazed at the Gensierians with a world of scorn mirrored in her eyes. And then she remembered Bolivar. He mustn't touch it, she thought inwardly. He mustn't! Slowly, she began to crawl to the open door to warn him; twice her strength failed her and she had to rest under the scrutiny of those alien eyes. She again began the slow, painful crawl toward the platter. Over and over she repeated in a scarcely audible voice the anguished refrain, as she called his name.

BOLIVAR, too, had been aroused by the tantalizing odor. He crouched in a corner of his cell and eyed the open door and the food platter, trying to think. But the power of coherent thought had left him now. He only knew that there, a long distance away, there was food. A ravening, an insane desire consumed him as he started to inch his way towards the platter. It seemed to be an eternity away from him, and he whimpered and growled by turns. The blurred figures of his captors he ignored—they had no meaning. There was only one reality—the food.

Then he heard a rustling sound and the sobbing insistence of a voice. He stopped. Dimly he remembered a "she." Would she try to rob him of his food? With a tremendous effort he gathered his ebbing strength and tried to go faster, unaware of the hoarse sound issuing from his throat. He got to the door. He eyed the platter which was now almost within his reach, and a wave of nausea shook him in its grip.

When Bolivar opened his eyes, he saw her. She was near the platter too, but not as near as he. His lips drew back in a savage snarl, and his eyes glowed with a towering rage. "Trying to steal my food," he thought. He gave a low growl and pounced on the food, his emaciated hands trembling over the prize.

"Don't Bolivar! Don't . . . eat it! Oh, my darling!" It was a heart-rending cry that issued from Stella's throat, and with it went the last of her strength. She fell and lay gasping between sobs.

Bolivar heard it. It came to him dim and far-away. He gazed at her inert form, as all the tenderness in that cry began to dispel the crimson fog from his mind. He hesitated and looked at the food.

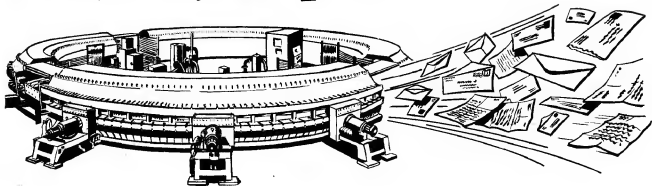
"Bolivar . . ." Her voice was so faint it could scarcely be heard.

He gazed at Stella lying, so white, so pitifully thin, and trembling, and sobbing, he called her name, he dragged himself to her side. Tenderly he raised her head, then cradled her in his arms. He took a morsel of food from the platter and placed it in her mouth; several times he fed her, waiting for her to swallow each time, as he smoothed her hair and caressed her. Not until she could no longer eat, did he begin to eat.

Varona gazed at Moldav in the absolute silence of the passageway, and each saw the other's eyes were wet.

"We're not alone, at last!" Varona exclaimed in an altered voice. "These are our inheritors!" And for the first time in many centorhitemps, the tears coursed down his ancient cheeks as he wept unashamed.

CHAIN REACTION



OUR VOLUMINOUS mail seems to indicate that **SCIENCE-FICTION+** is the most dramatically new idea in science-fiction magazines since 1926. Physically, our large format with the highest grade slick paper stock obtainable makes the magazine unique. Our cover paintings, reproduced in four and five colors by the finest lithographic processes, have added a new dimension to science-fiction illustrating. Inside we have been unstinted in the use of expensive two-color half-tone plates and have not hesitated to "bleed" our illustrations on all sides when we felt it would make for more effective presentation. Hand lettering and extravagant layout by professionals are costly, but we feel the result is worthwhile.

We have brought back to science-fiction that fabulous illustrating imagination, Frank R. Paul, and have experimented with many new artists, Thomas O'Reilly in particular receiving popular acclaim as a new "discovery" in the science-fiction field.

A great deal of thought has gone into such things as the selection of an attractive and highly readable type-face, which permitted maximum wordage. Due to the fact that our large pages hold close to 1,300 words of text and the total absence of advertisements, **SCIENCE-FICTION+** offers more reading material than any of the leading digest-sized S-F magazines.

SCIENCE-FICTION+ is primarily a fiction magazine, and it is in this department that we have done our real work. Though there are too few good science-fiction authors for the many magazines in the field today, we have attracted to our pages such outstanding performers as Philip José Farmer, who created a sensation with his novel, *The Lovers*; Clifford D. Simak, author of the renowned "cities" series, and one of the half-dozen leading authors in the science-fiction world today; Murray Leinster, writing the fine brand of science-fiction for us that established his popularity; Harry Bates, author of the story on which the motion picture, "The Day the Earth Stood Still," was based, breaking a 12-year writing fast especially for us; and Raymond Z. Gallun, who wrote the well-remembered "Old Faithful". In addition we have induced such famous old-timers as Eando Binder, Frank Belknap Long, Harry Walton, Robert Bloch, and Richard Tooker to return to the writing of science-fiction after long layoffs. New stars on the horizon, such as F. L. Wallace and Chard Oliver, have been invited to contribute. Lawrence E. Larkey sold us his very first story. From France we imported *The Stolen Minute*, by Pierre Devaux and H. G. Viot.

In the line of nonfiction we have introduced to science-fiction the illustrious scientific names of Donald H. Menzel, Leslie R. Shephard, and Gustav Albrecht. Those articles, like Hugo Gernsback's, all bear a close relationship to the fiction we print and at all times have been profusely illustrated.

Our departments have been numerous, much thought and time being expended on them. Particularly popular has been the elaborate **SCIENCE NEWS SHORTS**.

In the future, Frank R. Paul and Alex Schomburg will continue to do their magnificent cover work. On the interiors we are adding to our regular contributors Virgil Finlay and Lawrence. We shall continue to explore the vast possibilities of our format in the layout and presentation of material.

More stories are in the offing by Clifford D. Simak, Philip José Farmer, Harry Bates, Frank Belknap Long, and Murray Leinster. In our next issue Jack Williamson will be added to our roster of star authors, and there is a good chance that Thomas Calvert McClary, famed author of "Rebirth," may soon be noted among our contributors.

The handling of the article, "The End of the Moon," in this issue gives you an idea of the potentialities of presenting feature article material. If you feel that the pains we took in presenting the material so elaborately were justified, we will repeat similar features in the future.

SCIENCE-FICTION+ is the first magazine in many years to attempt to sell "pure" science-fiction to the public. Not watered science-fantasies, not westerns on a planet, not stylistic flourishes with no story, but tales in which care was paid to story, science, and style without neglecting any of the essentials.

Some magazines make a policy of padding their contents page with numerous very short stories, often eliminating a good longer one to do so. We believe the readers of **SCIENCE-FICTION+** are too intelligent to be hoodwinked in this manner. In this issue there is no **Short-Short+**. None came in that we thought worthy of publication. Next month several good ones may be submitted. If so, we'll buy them. We think that good stories, regardless of length, are more important than an artificially "balanced" contents.

Do you like our present stories? The illustrations? Is **SCIENCE NEWS SHORTS** too long or too short? Do you want more or fewer **BOOK REVIEWS** and **SCIENCE QUESTIONS AND ANSWERS**? A readers' department? Your letters will decide.

—Sam Moskowitz.

Hands across

by CHAD OLIVER

The first step in the scientific method involves the observation of facts and the formulation of THE PROBLEM . . .

THE MAN NAMED Copa Paco did not, of course, think of himself as an alien.

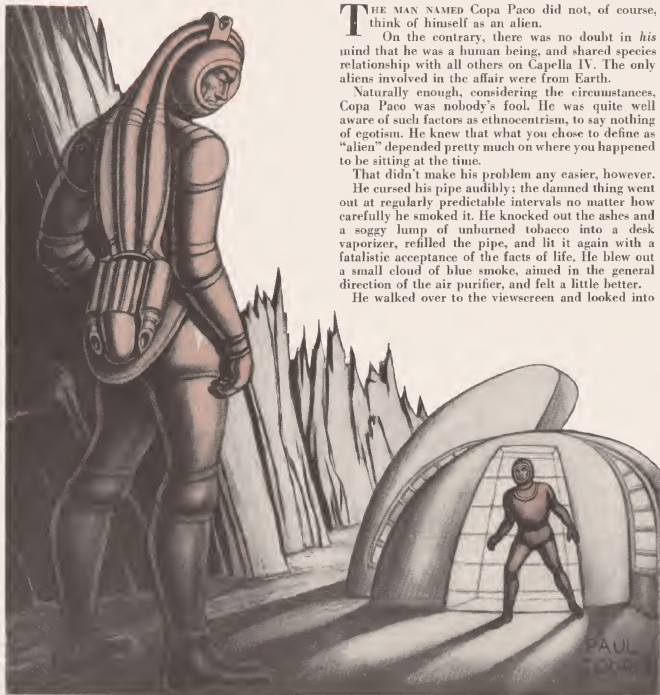
On the contrary, there was no doubt in his mind that he was a human being, and shared species relationship with all others on Capella IV. The only aliens involved in the affair were from Earth.

Naturally enough, considering the circumstances, Copa Paco was nobody's fool. He was quite well aware of such factors as ethnocentrism, to say nothing of egotism. He knew that what you chose to define as "alien" depended pretty much on where you happened to be sitting at the time.

That didn't make his problem any easier, however.

He cursed his pipe audibly; the damned thing went out at regularly predictable intervals no matter how carefully he smoked it. He knocked out the ashes and a soggy lump of unburned tobacco into a desk vaporizer, refilled the pipe, and lit it again with a fatalistic acceptance of the facts of life. He blew out a small cloud of blue smoke, aimed in the general direction of the air purifier, and felt a little better.

He walked over to the viewscreen and looked into



"The two men from different star systems stared at each other."

(Illustration by Paul Cooper)

space

it. The stars looked back at him, and the system of Sol was very close. He began to feel worse again. The palms of his hands started to sweat.

"I wish the whole planet would drop dead," Copa Paco said.

"You'd better take it easy, guy," advised Dota Tado, the semantics expert. "If you blow your top, we're through. Anyway, you're mixing your metaphors, or something."

"I wish you'd drop dead also," communicated Copa Paco, puffing harshly on his pipe.

"Civil war," said Dota Tado. "A great beginning. You're supposed to be a co-ordinator, remember? Don't you read your own propaganda? You're a disgrace to the force. I'd have you shot at sunrise, except that there isn't any sunrise."

"Oh, go to hell," responded Copa Paco, but he smiled in spite of himself. Dota was a good man; he knew his business. "I'm okay, really," he said. "Just spouting off steam. It's just that every once in a while you get to thinking about it, and how close it is, and how much depends on it—you know."

"Yes, I know. I know, too, that you'll come through with flying colors; stop worrying about it."

"Good advice," admitted Copa Paco. "Try to take it."

The ship throbbed around them with the surging power of the overdrive, and both men fell silent. Copa Paco smoked his pipe carefully, nursing it along.

He felt the cold sweat in his hands and wiped them on his handkerchief.

It was a nasty problem—nasty because it had never been faced before.

Nasty because there was no known solution.

He went over it again, step by step.

The world of Capella IV—his world—was quite similar to Earth. It was, in fact, almost identical. This was largely a coincidence, since the Anuragae system, of which Capella was a part, happened to be a binary, with Capella being a good sixteen times as large as Sol, though of the same general type.

It was a coincidence that had consequences, however.

Life had evolved on Capella IV in exactly the same manner that it had on Earth. All of the details were not *precisely* the same, of course, but there was a part-for-part correspondence of generalized stages. Capella IV had its aquatic forms, its amphibians, its reptiles, its mammals. It had its own counterpart of the *Dryopithecus-Meganthropus-Pithecanthropus* chain, culminating finally in Homo sapiens—an erect biped, pleased with his brain, handy with his hands, variable in his color.

The biped had dreamed of the stars, and his dreams had come true.

"Unfortunately," Copa Paco said aloud.

Dreams were different when they came true. For

Within the last few hundred years, unknown communities, semi-civilized tribes that for ages have lived out their lives alone, have been uncovered. In most cases, they are scientifically and culturally behind the rest of the civilized world, and if they do not actually welcome the intrusion, they do not have the force to resist it. But the time must come when a race as advanced as ourselves will appear from out of space. Then the problem of making first contact and establishing relationship will call for a careful, infallible scientific approach on the part of both sides.

one thing, the people involved were no longer dreaming. When they woke up, the monster with ten legs and fetid breath didn't disappear. He was still there.

The people of Capella IV had gone out into space, trying to find out what sort of a universe they lived in, trying to find out whether or not they had neighbors.

They had.

The galaxy teemed with life.

But not with "neighbors," unless mere physical proximity was the only criterion of neighborliness. They found that life took many forms. They found out how *different* life could be. There was absolutely no basis for getting together; nothing in common whatsoever. It wasn't that the life-forms were *hostile*; hardly. They didn't even have a *concept* of hostility, or of friendliness. They were *different*.

Alien.

Isolated.

Twenty-five years ago, they had contacted the Earth. They had found a life-form physically indistinguishable from themselves, with a fairly similar civilization and a crude form of interplanetary—not interstellar—travel based on thrust-jet principles. The ships of Capella IV were powered by fields of negative electricity.

The people of Earth had hydrogen bombs.

The people of Capella IV had force fields and overdrive.

FOR twenty-five years, the two peoples had surveyed each other, discussed each other, sparred with each other. They had exchanged radio telephotographs and information. They had probed and speculated. They had wondered and guessed. For twenty-five years.

Of course, they were afraid of each other. The people from Capella IV were afraid of the bomb, which they didn't have. The people from Earth were afraid of the overdrive, which they didn't have, and which meant that the Capella ships could attack the Earth, and then retreat to the stars where they could not be followed.

Both were afraid of each other, because they weren't *sure* they understood each other.

Espionage through scientific means had given each world much information about the other.

They had never met, face to face. Until now.

Chad Oliver

Twenty-five-year-old Chad Oliver has sold to almost every science-fiction magazine in the field. He is now working for his Ph.D. at University of California at Los Angeles. He has hopes of being a professional anthropologist. Writing is a hobby and he has had one book published. His short story, "The Boy Next Door," received honorable mention in Martha Foley's famous annual, BEST SHORT STORIES OF 1952.



COPA PACO stared glumly at his cold pipe, which had gone out again. He tapped the refuse into the vaporizer and put the pipe away. He stared into the viewscreen, hypnotically.

He could see Earth now, far away.

They had finally decided to take a chance, these two peoples separated by forty-two light-years and an ocean of emptiness. They had agreed to meet—one man from each planet, unarmed.

It had to be in the system of Sol, of course, because there was no way for the people of Earth to get to Capella. They had picked a very small, specially constructed chamber on the planet called Mars for the meeting. Each group had built half of it, and each had inspected it a thousand times. They had taken turns every 100 Mars days to make certain that no workers of the opposites races ever saw each other or met on Mars in person.

Ten years had been required for that compromise.

One man from each group, meeting in a tiny room on a neutral planet, a planet without life of its own. Each man representing cultures separated by a universe and millions of years of independent evolution. Each man carrying a responsibility almost too fantastic to be real.

If the meeting were a success, there might be a future with boundless possibilities.

If it were a failure, if there were trickery, if they had made a mistake—

It might depend on a little thing, a nothing-thing. How could you tell? "John Smith" was a common name on Earth; to a man from Capella IV it was excruciatingly funny, as well as illogical. The people of Capella IV had systematic names, names that placed each person as to status and role by the pattern of alternating morphemes—Copa Paco, Lota Talo, Dota Tado. This seemed funny to the men of Earth, who, in turn, when a baby was born named it practically anything that suited their fancy.

The little things were different, and that could be very dangerous, even assuming good intentions on both sides.

If you had to pick one individual to represent your entire species, one upon whom your very existence might well depend, whom would you pick?

Whom could you pick?

The man named Copa Paco looked into the viewscreen, staring at the stars and the planets and the darkness.

That was his problem—and he knew, too, that this same problem had to be faced by a man on Earth, a man like himself. A man who even now must be wondering, trying to decide—

Whom would he pick?

After the formulation of the problem, the next step, in strict chronology, involves the working out of the hypothesis, or trial solution. Passing this by for the moment, however, we turn to what is actually the third step, the testing of the hypothesis in experience, or THE EXPERIMENT . . .

JOHN GRAVES walked steadily through the sand canyon and listened to his breathing in his oxygen mask. It was slow and even, neither excited nor lethargic, and he smiled with satisfaction. He had been a little worried before, but now he knew that he was not going to be afraid.

He was ready.

The cold wind hissed and whispered through the tunnels and twisted valleys, and then whined eerily

out upon the cold desert beyond, losing itself in fine clouds of driven sand. It wrapped its icy fingers around John Graves as he walked, and it spoke of many things . . .

Mars.

It had never known life of its own; its only significance had been given to it by the thoughts and fears and dreams of a people over forty-eight million miles away.

John Graves felt a warm pride at the thought. His people.

First, perhaps, it had been a campfire in the sky, a cold fire that gave no warmth, to be looked at and puzzled over by the first man huddled around their own fire, listening to the night sounds around them.

Then it had become a god. Mars, god of war . . .

Finally, it had become a planet, one of several, orbited about the sun. The planet, with time, had become a symbol, a lure, an invitation across the empty miles. It had called out to the men of Earth, and they had come.

And this was the reality, at least for now. A cold desert of shifting sands and sculptured canyons, silent except for the sigh of the winds.

Neutral ground.

A meeting-place.

John Graves came out of the sand canyon and into the desert, his feet slipping slightly on the uncertain floor of the planet. Ahead of him, squatting all alone in the middle of the great plain, was the tiny building that housed a room for two.

He looked at his watch, and it was time.

Coming out of the desert from the other side, half hidden by the drifting curtains of reddish sand, he could see a dark figure moving slowly toward the building.

The two men from different star-systems stood in the little room and stared at each other. They were almost close enough to touch, but they did not touch.

The room was antiseptically plain. It was absolutely without character. It had dull gray walls and a single overhead light in the ceiling. It had a small gray table in the exact center of the room, and two hard gray chairs, one at each end of the table. There was an air-conditioning unit in one corner, and no other machinery of any kind within a two-hundred mile radius.

No one was taking any chances.

John Graves kept a smile on his face—it having been first determined, of course, that smiles meant the same thing to both of the representatives. It wouldn't do at all to smile at a man from a culture in which a smile was the equivalent of saying, "I find you mentally repulsive and physically appealing, and so I will eat you for supper." His job was threefold: he had to make a good impression, he had to protect the secrets of his people, and he had to evaluate the other man in the room.

He examined the man from Capella IV courteously but intently. The man from Capella IV examined him the same way.

John Graves couldn't see very much. The other man was clad in what appeared to be a light space-suit, complete with helmet. He seemed to be definitely humanoid in construction—he had two arms and two legs and one head. Behind the glass in his helmet, he could make out a pleasant face, rather brownish in color, with blue eyes and an open smile. The man seemed to be waiting for something.

There was a long, awkward silence.

Finally, John Graves reached up and took off his oxygen mask. He sniffed the air, and it was good.

No tricks so far, then. He noticed that the other man was smiling more broadly, but he made no attempt to remove his helmet. He simply stood there, waiting.

"Do you mind if I smoke?" asked John Graves, his voice cutting through the silence like a knife and sounding abnormally loud in his ears.

"Not at all," replied the other man instantly. His voice was low and well-modulated, crystal-clear through his helmet speaker.

John Graves fished out a cigarette and lit it. He inhaled a deep draught of smoke and blew it out through his nose, being careful to keep it away from the alien.

"My name is John Graves," he said.

"My name is Noco Cono," the other man said.

Neither volunteered any more information. The silence thickened. Again, John Graves took the initiative, thinking: *Evidently he's just going to respond to my cues; it's up to me to direct the interview.* He sat down in one of the chairs. The other man did not hesitate but lowered himself into the other one, still not making any move toward removing either his helmet or his spacesuit. *Hardly the impulsive type,* thought John Graves.

They looked at each other across the table.

"Well, where do we go from here, Mr. Cono?"

asked John Graves, reflecting again that it was quite decent of the aliens to agree to speak English during the interview.

Noco Cono chuckled pleasantly. "An excellent question, John Graves," he said. "I really must apologize for my seeming reticence; you are of course aware of the circumstances under which we meet."

Careful, thought John Graves. *Could that be a psychological probe?* He said: "Not at all, my friend. It is as much my fault as it is yours. I hope I may express the wish that we can meet again one of these days, and speak as man to man."

"That is my wish, also," the spacesuited figure said. "This is, of course, a difficult situation for both of us. I feel as though I were under a microscope."

"I too," agreed John Graves.

They indulged in some highly tentative exploratory conversation, they both chuckled many times over their mutual recognition of the awkwardness of the situation, and their talk was, if not friendly, at least cordial.

Then the silence came again. They sat across the table from each other in the little gray room, looking at each other.

What of the discussion of their closely related planets? Of the universe? Of philosophies, related or opposing? Here there seemed to be a block—an unexplainable block . . .

When the agreed-upon termination time had arrived, neither of them had said a great deal.

John Graves had done his best to give a good impression, but he was not sure whether or not he had succeeded. How could one tell? Everything had seemed pleasant enough, but the other man had never offered to remove his helmet or his spacesuit, and evidently wasn't going to do so. Why? Graves had never been able to get a good look at the man.

They both stood up, and there was tension in the room. It wasn't exactly fear, nor was it hope, but it was compounded of both of these. So much depended on the outcome of this simple little visit, so much could be gained or lost. . . .

They both felt it.

"I know that we're both thinking the same thing,"

John Graves said slowly. "I can't speak with much authority, but just as a man. I hope with all my

heart that this is a beginning, and not an ending." The spacesuited man nodded. "I feel the same way, my friend," he said. "This has been a tough job for both of us, and I hope that out of it great things will come. I hope that this is not goodbye. I hope that both of our peoples will be blessed with—understanding. *Understanding.* That is a good word. Next to a sense of humor, it is what one needs the most."

They walked to the door together. John Graves stopped and put on his oxygen mask, and then they both walked back outside. They paused, and John Graves put out his hand. The other man took it, gently, in his spacesuit glove, and they shook hands, Earth-fashion. Then the other man waved briefly and set out across the desert for the rendezvous with his ship.

John Graves watched him go for a moment, registering all the data, no matter how unimportant. Then he turned and walked through the shifting sands, back into the sand canyon, his hands in his pockets.

He did not look back.

As previously indicated, we have left out a step in our scientific method, a step between the problem and the experiment. The step did occur, of course, and we go back for it now. Between the problem and the experiment comes the trial solution, or THE HYPOTHESIS . . .

COPA PACO was worried.

He puffed on his pipe and failed to get any smoke—the damnable thing had gone out again. Why was it, he wondered, that a culture that could devise an overdrive for interstellar flight could not invent a pipe that would stay lit? He toyed with the notion of dropping the whole pipe into the desk vaporizer, but rejected the idea. He understood that he was taking out his anxiety on his pipe and, primarily to prove a point to himself, he refilled the mutinous instrument with fresh tobacco and tried again.

He wiped his hands nervously on his handkerchief and looked at his watch. Four hours to zero.

It was time for the final check.

He walked through the great ship, feeling the surge of power trembling along its beams, his stomach a cold knot within him. He could feel the star-flecked emptiness outside the ship, a poignant emptiness, waiting.

The question that he had lived with for years crawled endlessly through his brain: *Had he made the right decision?* Soon now, he would know.

The problem of picking a single man to represent your people and your culture in a truly crucial situation was virtually beyond solution, and Copa Paco knew it. He had wrestled with it so long that he knew every angle, every consideration, every argument. The only thing he didn't know with certainty was the answer.

He listened to his heels clicking down the corridor, and he thought: *It's too late to back down now, and that's something. We'll just have to go through with it.*

It was easy enough to think of someone who was especially gifted along a particular line, such as mathematics or sociology or art. It was even possible to find individuals who had talent and training in all three fields. Conceivably, some fantastic individual might exist, somewhere, who was expert in ten fields, or even twenty.

Unfortunately, that wasn't good enough.

There was, certainly, an excellent possibility that

any good man could successfully represent his people in the coming encounter between two alien peoples—a diplomat, perhaps. But the catch was that an “excellent possibility” still wasn’t good enough for *this* situation. There simply was too much dependent on the outcome.

You had to be *sure*.

Easy enough to state, but what was the answer? He had to find a representative who could respond to any imaginable combination of trickery or force. Unpleasant as it was, he had to plan on the possibility that the people of Earth would not keep faith with them. His own people of Capella IV had only honorable intentions, of course, but that didn’t mean that they were going to stick their collective head into the lion’s mouth and rely on a smile to get them out again. The trick was to be prepared for the worst, but be capable of responding to the best.

The characteristics of the required representative could be listed briefly. One, he had to make a good impression. Two, he had to be ready for anything, insofar as possible, so that he could not be outwitted. Three, he had to be capable of making a complete and accurate report back to his superiors; no one man, naturally, could be entrusted with the power of decision in such a case. Fourth and last, he had to embody some sort of built-in defense mechanism, so that, in the event of his capture, he could not possibly be made to reveal classified information, no matter what pressures were brought to bear.

The characteristics could be listed, then. It wasn’t even unduly difficult to do so. The difficulty lay in quite another direction: *no such human being existed*.

Nor ever had existed, nor ever would.

Once you accepted that fact, of course, there was only one thing to do.

Copa Paco passed through the security check and into the special control room, his pipe still going. Maybe, he thought, that was a good sign.

It had better be.

He nodded to his co-workers and looked around. The room appeared to be ready. There was a large, spherical screen that occupied the whole center of the room—blank now. Around the screen were fifty chairs, each with a small control panel on one arm. The future occupants of the chairs milled about the room in a fog of blue smoke and conversation—semantics experts, philosophers, chemists, anthropologists, psychologists, generals, writers, doctors, corporation managers, diplomats.

Above the spherical screen, situated so that the observer could look down into it, was another chair, completely surrounded by integration controls that co-ordinated the information from below. Copa Paco looked at it, nervously. His chair.

He climbed up into it and settled himself. He clamped on his headphones and switched on the master control panel. He put down his pipe and picked up an auxiliary phone.

“Trial run,” he said.

The others took their places, silent now, and cut in their sets. The spherical screen flashed white and came to life. It revealed four rather drab green walls, a ceiling, and a floor. A storeroom.

Copa Paco steadied his hands and played his fingers over the control panel. There wasn’t a sound. Gradually, the scene in the spherical screen shifted, swaying very slightly, precisely as does a view scene through the two eyes of a walking man. There was a door, which opened and shut. Then a corridor, long and featureless. Another door—

There was a polite knock and the door of the special control room clicked softly open. The scene in the screen changed to the room in which they all sat—Copa Paco saw himself clearly, looking pale and nervous.

A spacesuited figure walked into the room, carefully. He had on a glass helmet, behind which could be made out rather pleasant features, blue eyes, and an open smile. He stopped respectfully.

“My name is Noco Cono,” the spacesuited figure said in a soothing, well-modulated voice. He spoke in English. “I hope I may be of some assistance.”

There was a buzz of approval from the assembled men, and Copa Paco felt himself relax a little.

There was no denying it—the robot was well made.

When the ship finally landed just outside the restricted area on Mars, and they started the spacesuited assemblage of radio controls, tri-di, and testing apparatus toward the tiny building in the desert where the meeting was to take place, Copa Paco began to worry again.

He sat tensely in his chair, following Noco Cono’s every move in the spherical screen. The robot walked easily, gracefully, through the shifting sands. He looked convincing. He acted natural.

But he wasn’t human, of course.

Copa Paco asked himself, as always: *Have I done the right thing? What if they find out? What if I’ve thrown away our only chance, just out of caution? It isn’t really that I distrust Earth, of course—but what else can I do?*

The problem was exactly analogous to hunting for a house in which to live. If you couldn’t find precisely what you wanted, at the price you could afford to pay, there was only one course of action open to you.

Build your own.

The robot they had called Noco Cono wasn’t precisely a robot, of course—that is, he wasn’t a mechanical man with a mind of his own. Rather, he was an integrated synthesis of fifty remote minds—fifty men, each with a control panel, each able to take over in any conceivable situation, each seeing out of his eyes through the spherical screen and hearing every word through radio transmission.

Noco Cono, whatever else he may have been, was no fool.

Copa Paco watched him, step by step—he was on automatic now. He watched him walk through the desert, and he saw the little building loom up before him.

Beyond the building, a dark figure.

The man from Earth.

Copa Paco wiped the sweat off his hands and felt the tension in the special control room. Every eye, every thought, was on the spherical screen, and on the spacesuited figure that walked slowly on, closer and closer—

First contact. Whom had they sent?

The final step in the scientific method is known as the solution. From the solution, if all has gone well, may often be derived certain GENERAL PRINCIPLES . . .

RALPH HAWLEY paced up and down the evaluation room, alternately staring at his watch and smoking cigarettes in short, jerky puffs. The others sat nervously in their chairs, watching him.

“What’s he doing?” he asked again. “Where in the hell can he be?”

Lee Gomez, by profession a philosopher and by

temperament not prone to impatience or, indeed, haste in any form, said: "Sit down, Ralph. John isn't overdue yet, and he's no doubt doing exactly what he's supposed to be doing—contacting our non-Earthly friends."

"Ummm," said Ralph Hawley, hooking his thumbs in his suspenders. And, sensing the inadequacy of the phrase, he added: "Three cheers for John, he is true blue." Damn Gomez anyway—he was always right, and Hawley knew it, and it annoyed him.

"My professional opinion," stated Dr. Weinstein, "not that anyone is interested, is that we are all suffering from the scientific malady known by the technical term of *Gestalt Jitterus*. What we really need is a drink."

Ralph Hawley ran a hand through his graying hair. "Not yet," he said. "Not that I couldn't use one."

He continued his pacing, which was in itself unusual, for Ralph Hawley was not ordinarily a nervous man. He was tall, rather spare, with a pleasantly horse-like face. He was given to sloppy clothes, infrequent movements, and slow speech. By trade he was a social psychologist, and he was the last person in the world that he himself would have picked to head Project Contact.

"Where is he?" he asked again, lighting another cigarette.

A red light flashed.

A speaker said: "John Graves has entered the ship. He has not been harmed, and reports a nonantagonistic contact, with some complications. As instructed, we have sent him to the evaluation room. Situation green, shading yellow. Over."

There was a knock on the door. A pause. The door swung open and John Graves walked in. Every eye in the room stared at him. He took it very well, never losing his poise for an instant.

"I'm quite all right," he said calmly. "You can relax." No one relaxed.

John Graves walked up to Ralph Hawley and smiled. "It went off like clockwork, Ralph," he said. "Of course, I couldn't get a good look at the man, but it was a fascinating experience. I suppose you want a full report, from the beginning?"

"That won't be necessary, John," Ralph Hawley said.

"I beg your pardon? I was given to understand that—"

Ralph Hawley sighed. Then, quickly, he reached out and turned John Graves off.

John Graves stiffened instantly, and the life left his eyes. He stood very still. He did not breathe. He was not "dead," of course, since, properly speaking, he had never been "alive."

Ralph Hawley stripped off John's shirt and opened a panel in his chest. He took out the cameras, the recorders, the testers, the analyzers, the dials, the data cards.

"Print these up and get an analysis," he told his specialists.

The object that was John Graves stood immobile in the center of the room, empty and alone.

When the last film had been studied, the last card interpreted, the last sentence broken down and examined, there was a stunned silence in the evaluation room.

"Well, I'll be damned," Ralph Hawley said.

There was a burst of comments in the room:

"They didn't trust us!"

"They tried to trick us!"

"They sent a remote-controlled robot!"

"The clever devils . . ."

Ralph Hawley sat down in a chair. He stared blankly at nothing. He said: "Don't you see what this means?"

The others looked at him.

"They tried the identical trick on us that we tried on them," said a psychologist. "Or roughly identical, anyway."

"They worked out the same basic solution to the same problem," an anthropologist said.

"They're our kind," said Gomez, the philosopher. "Cautious, insecure, tricky, proud, capable, liars . . ."

Ralph Hawley closed his eyes. There was only one solution to the basic problem, of course, if you assumed that the two cultures saw the problems in the same terms. No human being could be entrusted with such a mission; it was unthinkable. And so the aliens had sent a robot, and Earth had sent—

John Graves.

An artificial humanoid mechanism, twenty years in the making, designed to perform with inhuman skill in a contact situation. Designed to believe it was a human being, so that it did not have to play a part. Designed with built-in recording devices, and equipped with fantastically skilled behavior patterns—but lacking classified data.

A robot and a limited android—two representatives of two cultures that were afraid to trust each other.

Two very similar cultures.

"Gentlemen," Ralph Hawley said quietly, "we are equals."

The red light flashed again.

The speaker said: "Commander Hawley, Co-ordinator Paco is calling from the alien ship. I have routed his call through to the evaluation room."

Ralph Hawley grinned. "The old buzzard!" he said.

He walked over to the communicator.

Copa Paco looked at him and smiled.

Ralph Hawley smiled back.

"I see we didn't fool you," Copa Paco said.

"No. And I'm sure we didn't fool you."

"No," agreed Copa Paco. "Extremely clever, however."

"Thank you. Yours was pretty tricky too."

A pause.

"Listen, Ralph," said Copa Paco finally, "this isn't getting us anywhere. Why not come on over yourself and let's have a talk—over drinks?"

Ralph Hawley hesitated only an instant. "It's a deal, my friend," he said. "I'll come."

Copa Paco smiled more broadly. "Now we're accomplishing something."

"See you in half an hour," Ralph Hawley said, and switched off the communicator.

He turned and looked at his specialists. They were laughing and clapping each other on the back. The tension was gone.

They had not failed.

Everything was going to be all right.

The others gathered in a knot around him as he stepped into the port of the space shuttle that was to carry him to the alien ship. Everyone was trying to shake his hand and wish him well. For almost the first time in his life, Ralph Hawley was completely happy, and proud of the human race.

Just before he left, an aide appeared with a case of Hawley's own liquor, which was loaded aboard the shuttle.

"I thought Paco invited you to drink," objected Lee Gomez. "Why take your own liquor?"

Ralph Hawley smiled. "A man can't be too careful," he said, and closed the port behind him. +



The *STOLEN* MINUTE

PART TWO

Old readers of science-fiction will often complain that some authors have fine ideas but no imagination to exploit fully the potentialities. This cannot be said of Pierre Devaux and H. G. Viot. What would happen if the motion of the atoms that compose the human body were accelerated 100,000 times? The ingenuity displayed by these authors opens a new field of science-fiction to exploration. In addition, thoroughness is combined with fast action.

SYNOPSIS OF PART ONE

A noted French specialist in molecular physics, Claude Noroy, has discovered a chemical formula that vastly increases the metabolism of the human body. This drug speeds up the living rate, motion, body speed, and all other human functions by 100,000 times. When the drug is taken internally, all moving things appear to be "frozen" to the subject, who in turn becomes invisible to others because of his accelerated speed. This drug, hexo-styro-molybdenum, or H.S.M., enables Professor Noroy to protect his friend, Jules Marandon, discoverer of another dramatic formula—for the conversion of sea water into fuel—from several attacks by various big business interests and foreign

speculators who, if they were to obtain Marandon's formula, would exploit it and quickly upset the economy of the entire world. Noroy is trying to convince the Government to take control of the formula and its use. Meanwhile he steals the documents, with the aid of H.S.M., from a triple-locked vault of the *Dodecagon*, a Government fortress for scientific research. He hides the papers in the wallet of the Chief of Staff, General Favre-Perronnet, and steals them again when they are outside the well-guarded walls. Now, Noroy makes plans to convince the Government of the crucial importance of the new sea-water fuel ... Now continue with part two ...

ON LEAVING the General after the dramatic meeting at the *Dodecagon* and the "disappearance" of Marandon's documents, Claude Noroy went straight to his laboratory, the wide bay-windows of which faced the deserted street. He sat down at his desk, examined Favre-Perronnet's wallet attentively, withdrew the precious papers, and dropped them on his blotting-pad. Then in the dim light of the room the scientist studied carefully the three white sheets which were spread out on the black table. The first was "A Report on the Bivalence of Hydrogen" and the second was "A Table of the Atomic Structure of Helium." The third and smallest sheet contained two mathematical formulas: one, a classical chemical equation; the other, an equation with reversed

arrows—the sign of a reversible reaction. At the very end of the latter equation there was a compound word, a surprising word, written in Marandon's heavy hand: "quasi-petroleum."

These three sheets were a more powerful explosive than the atomic bomb. They contained the death sentence of the petroleum industry, signed by Jules Marandon.

When the old chemist had informed him of the nature of his remarkable invention, Noroy at first had not fully grasped its significance. He had, however, been quick to realize that he had to protect Marandon and to keep his discovery a secret. The annals of science tell us that as soon as the existence of a great discovery has been publicized, such discovery does

(Illustrations by Jay Landau)



"The fiery serpent had him as its prey."

by **PIERRE DEVAUX and H. G. VIOT**

(Translated from the French by Sabine and Leonard J. Wang)

not long remain the exclusive property of its creators.

Marandon was now in safe hands. Moreover, his safety was assured by his state of health. No spy could hope to gain any information for the time being from the stricken and unconscious scientist. Noroy sighed with relief. Fate had granted him the time to study and to microfilm the documents which he had, thanks to H.S.M., miraculously "borrowed" from the vault of the *Dodecagon*. With this fact in mind Noroy worked feverishly through the night.

Claude Noroy's students, his colleagues at the Collège de France, and his innumerable admirers, who were accustomed to see his name figure in official receptions, would have been very surprised if they had seen him at work that night. Noroy, the rational, Cartesian, and phlegmatic scientist, was moving with a rapidity which would have put an athlete to shame. They would have seen him alternately stare at the complicated formulas, mutter them under his breath, and then push aside the three sheets of paper as if he had wanted to sweep them from his mind. A gigantic revolution was taking place in his brain, and the wall of his peaceful study was flaming like the fateful wall in Belshazzar's palace. The excited scientist seemed to see a finger of fire tracing a message of destruction on the wall. In his mind's eye Noroy could see high iron towers collapse into the dust, pipe-lines being abandoned in the sand, huge factories falling into ruins, and vast quantities of materials rotting under the sun. Signs on the closed doors of the oil refineries spelled out a hopeless message: **SHUT DOWN.**

Noroy was standing now as if he were attending a funeral. Before his eyes the walls of his room seemed

to melt away, and he gazed upon cities which were fearfully following the trends of the stock market. He heard the continuous clicking of the ticker-tape machines, the ringing of telephones, and the excited voices of telephone operators making calls to the various capitals of the world. . . . A high-columned building suddenly loomed before him. Within this building hell had broken loose. People were screaming, cursing, and calling out to one another. He could hear the tragic cry of desperate sellers: "I have . . . I have . . . I have . . . I have at 832 . . . I have at 830 . . . at 815 . . . at 785 . . . at 700 . . . at 600 . . .". Everywhere men with frightened faces, wide-open mouths, and anguished eyes were wringing their hands in despair. Like an equinoctial tide, stock prices rose, then fell, and finally plunged to zero. The clerks, who were perched on ladders and were recording the price fluctuations on the Exchange's huge bulletin boards, were unable to keep pace with the proceedings. Outside, newspapers were selling special editions of the Parisian newspapers whose solemn headlines announced the economic collapse of the nation and the world. "Extra! Extra!" they shouted. "Stock market crash wrecks world's economy!" In the stock-brokers' ring, the head of the brokers' association, white as a sheet, hesitated to put an end to the buying and selling and nervously waited for orders from the Government.

"450 . . . 350 . . . at 300 . . . at 150 . . . I have . . . I have . . . I have . . ." There were sobs in the distance, cries of despair.

There were long lines in front of the Government's unemployment office, and shouts for a revolution . . . Then silence. Noroy saw and heard no more. His



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painful vision had ended. The scientist leaned on the window-sill, breathed in the night air, and pulled himself together. Determinedly he steadied his nerves. A few seconds later Claude Noroy had become once more a resolute and responsible human being—one of the glories of his country and of science.

When Noroy returned to his desk, his mind was made up. He knew that if Marandon's admirable invention were to fall into the wrong hands, one of mankind's most important industries would be completely wiped out. He also knew that the death of the oil industry would spell certain ruin for a vast number of industries which either used or manufactured the by-products of petroleum. For lack of pitch, lubricating oil, paraffin, and other such products, men could not pave roads, produce electricity, or operate machines. . . . Noroy shuddered and resolved to do everything in his power to save civilization from such a crisis.

The professor picked up his mesothorium cigarette lighter and lit a cigarette which he placed almost immediately in an ashtray on his desk. Then he got up, picked up the three sheets, and glanced in the direction of his microfilming equipment. He knew what he had to do: France alone, he felt, with its traditions of liberalism and prudence, was capable of exploiting Marandon's invention without causing a global disaster. And France now—the scientist smiled as he paraphrased the famous remark attributed to Louis XIV—was none other than he, Claude Noroy.

It was absolutely necessary to put Marandon's documents in a safe place. And there existed nowhere a strong-room comparable to the *Dodecagon*. Noroy thought for a moment and then snapped his fingers. He quickly put on his white laboratory coat and carried Marandon's papers into the small windowless room which contained his microfilming machine. Minutes later he came out beaming; the microfilm containing Marandon's formulas was in every way satisfactory. Joyfully he picked up Favre-Perronnet's wallet—a magnificent wallet made of the finest alligator skin. With a scalpel he slit the wallet and slipped the microfilm, which held his old friend's secrets, between the hard leather and the inner silk lining. Then, carefully, sewed it up again. This done, he polished it with a little wax and a woolen rag. The wallet was once again as good as new. Noroy inspected his handiwork with satisfaction. Tomorrow, after a good night's rest, he would take up the fight once more.

A SCREECHING of brakes made him raise his head, and he understood immediately that sleep was out of the question for him that night. The ensuing silence was broken only by distant noises coming from the city. A moment later he saw moving shadows in the darkness of the garden. Outside the gate which had been noiselessly opened three cars were parked.

Noroy grabbed his telephone feverishly, but he did not hear the familiar buzz which allowed him to put through a call. The doorbell now began to ring. The professor quickly realized that he had only one choice

—H.S.M., hexo-styro-molybdenum, the drug that speeds up man's metabolism 100,000 times.

Noroy stuffed into his pockets all the cash that was within his reach, slipped Favre-Perronnet's wallet into the inside pocket of his jacket, swallowed a pill A, and moved toward the staircase.

On the ground floor he found the hall invaded by a half-dozen immobile men who seemed to be lying in wait for him. The spectacle of these petrified men was not new to him. Familiar with the effects of H.S.M. and capable of turning it to his best advantage he was neither disturbed nor surprised by what he saw.

Seizing with his two hands the brim of the hat of the man nearest him, he pulled it down over its owner's eyes and ears. Half of the gunman's face immediately disappeared. The others received the same treatment. Then the professor disarmed them and carefully fired their guns into the floor. Of course he didn't hear the detonation of the bullets, and each time that he discarded one of the empty guns it remained suspended in mid-air on the very spot where he had abandoned it. Following this, Noroy went out of the house and punctured the tires of the cars which were parked under his windows. Finally, to top things off, he wedged small pieces of wood into the horns of the three cars so that they would blow without stopping. Then, his task done, he moved off into the shadows of his silent garden.

He stopped about three hundred feet from his house and swallowed a neutralizing pill B which returned him to the normal rhythm of life. The pill had no sooner taken effect than he heard the deafening noise of the horns, and the shouts and curses of the men he had duped. Noroy easily imagined the bewilderment of his night visitors who were blinded by their hats and frightened by the noise of the detonations and by the interminable blaring of the horns. Perhaps, he thought, they were even exchanging blows in the darkness of his hall. And how were they going to escape with the tires punctured?

But Noroy didn't think long about these matters. In his mind's eye he suddenly saw his rug riddled with bullet holes and his foyer in shambles. Saddened by this vision he shrugged his shoulders philosophically, turned around, and slipped off into the night.

AFTER tricking his attackers, Noroy took a taxi to Montfort-l'Amaury, and then in the middle of the night, despite his fatigue, walked home. In order to make sure that he would not fall into a trap he swallowed a pill A of H.S.M. and explored the grounds around his house and the home of the Swiss scientist Esprels. Noticing nothing unusual, he went up to Esprel's study and swallowed a pill B. His sudden appearance terrified his old friend who was still trembling with fright as Noroy reproached him for his indiscretion.

"No, Esprels, it is very difficult for me to accept your explanation and your excuses. How could you have let Rides get the better of you? I warned you that he might try to steal Marandon's papers."

"But Rides told me that you were in complete agreement with him," Esprels replied. "According to him, only one man was holding up the negotiations, and that man was Favre-Perronnet. Rides insisted that his purpose in coming to France was to inform the members of the *Dodecagon* of the offers of his Government. He was certain that the council would compel General Favre to co-operate with him. And since he claimed that you approved of his plan I saw nothing wrong in lending him a helping hand. Now you're blaming me because Marandon's documents

were stolen. I feel just as badly about it as you do, you know. Besides, I find it difficult to believe that you couldn't do anything to prevent the theft."

His old friend's distress affected Noroy deeply. With one word he could have reassured him, and for a moment he even thought of disclosing all his plans to him. But Esprels was in no state to listen to him. Bent over his desk, his head in his hands, he was sobbing.

"I don't understand your grief," Noroy said to him. "You're taking what I said to you too much to heart. We will recover Marandon's documents and we will perfect his invention without Rides' help. Think rather of Marandon's sad fate. Think of me. I am a hunted man. Simply because, my dear Esprels, I was the only one who tried to thwart their plans. They will make me pay dearly for my interference."

"I think that I have already paid for you," Esprels tearfully stammered.

"What do you mean?"

"They have . . ." groaned the unhappy scientist, "*they have kidnaped Lina . . .*"

Not knowing what to say, Noroy remained silent and placed his hand affectionately on Esprels' shoulder. The old man, comforted by this gesture, pulled himself together.

"They grabbed my daughter under my very eyes just before dark," he murmured. "Lina was returning from a walk, and I went out to meet her just as I do every evening. A car bore down on us as we met on the road. It stopped and two men jumped out, seized my poor child, and shoved her into the car. A second later the auto tore off at a terrific speed. I had to jump into a ditch at the side of the road in order not to be crushed. Even so, the car grazed me and bruised my left hand badly. Look! I think those devils wanted to kill me . . ."

"I rushed home in order to alert the police, but as I reached the garden I heard the telephone ringing. Someone was calling me from Rambouillet, the operator told me. The voice at the other end of the wire told me to be prudent. Lina's safety, he added, depended on my being silent . . . Before hanging up the voice made it quite clear that he would get in touch with me again in the near future and tell me how I might get her back.

"I hurried to your house. Of course, I didn't expect to find you there. You had looked so worn-out at the *Dodecagon* that I was sure that you would spend the night in Paris . . . But I wanted to see Gilbert and tell him what had happened. Your son immediately tried to reach you by telephone, but without success. Gilbert was terribly upset. He ran to his car and set out to look for you . . . He is in Paris now."

So, Noroy thought, Gilbert was in Paris! Doubtless he would soon come home . . . What would happen to him when he did? Noroy shuddered . . .

Gilbert must have taken the news about Lina very hard, he thought. Lina and he were about to be engaged! He needs me. I must go to him at once. I will also have to keep a careful eye on Esprels. In order to get the girl back he would pay any price and might even tell the kidnapers what he knows of my experiments.

"No, I won't betray you," murmured Esprels who had caught the meaning of the look in Noroy's eye. "But at least do everything in your power to recover my child."

The ringing of the telephone prevented Noroy from answering the Swiss scientist. Before Esprels could move he pounced on the instrument and lifted the receiver.

"Hello, this is Gilbert," he heard. "Is my father there?"

"This is he speaking," Noroy replied. "Where are you?"

"I'm with Jean Thévenet at Marandon's house. Oh! dad, I must tell you . . ."

"Don't bother, son, I'll be with you in a few moments. Be patient and strong. We'll find a way out of this. See you soon." Noroy hung up.

"Esprels, you are no longer safe here," he said in a dry, dictatorial voice. "You must come along with me and live a very fast life for the next few days. We'll get Lina back if you will only co-operate with me."

"Look here, I've been following your orders for years," the old man stammered. "Today I . . ."

"Don't talk so much. Here, swallow this pill and follow me. Make sure that you don't leave any money around the house."

"Let me at least take a valise and . . ."

"We haven't got the time for that. We are leaving right now."

Esprels reluctantly swallowed a pill A of H.S.M. Noroy did the same. A few moments later the two men crossed the dark garden and entered Noroy's house. The professor didn't want to waste any time there. Quickly he took the money from his safe and put it in his pocket along with all the H.S.M. capsules that were in the house.

It is important to note that these capsules did not all contain the same quantity of hexo-styro-molybdenum. For example, the pill which he had just given to Esprels and the one which he had taken himself a moment later contained only an infinitesimal amount of the drug. The feeble organism of the old Swiss could not have tolerated a large quantity of the remarkable accelerator. Consequently, though the two men were moving with an astonishing speed, they still remained visible to all who might happen to see them. Furthermore, to take these drugs frequently, it was necessary to cut down on the dosage.

In Esprels' house the servants were sleeping; they were awakened by the slamming of the front door which Noroy had closed behind him, and immediately leaped from their beds. In Noroy's house Gertrude alone was still up. She saw her master and his old neighbor sprint past her with the speed of long-distance runners. It seemed to her that the two scientists scaled the staircase at one bound, and she remained glued to her chair, frightened half out of her wits.

Five seconds later she saw them reappear, race past her with the speed of a fireball, and literally spring through the open door into the night. Gertrude summoned all of her strength and screamed at the top of her lungs. Esprels' servants heard her shouts and rushed over to see what was the matter. Hastily they gave her a glass of water and then barraged her with questions. It was some time, however, before Gertrude could pull herself together.

"I will leave tomorrow," she finally squawked. "Listen . . . The other day I thought I would find Monsieur Noroy in his study. I knew that he was there: I had just heard him make a telephone call. His door slammed under my very eyes as if it had just opened and closed by itself. Then someone whistled in my ears. I was scared stiff, but I went into the room . . . No one was there . . . Yes, he had left . . . and all the windows were shut . . . and there was no other door. Monsieur Noroy, it seems, was in his neighbor's house and came back half an hour later! Today Monsieur played another trick on me. I just saw him running like a madman with his old friend Esprels . . . I don't think that Gilbert, who is half his



"The trees bore unusual fruits!"

age, could have run that fast . . . Why, he zipped out of the house with the speed of a racing car!"

"You've been drinking too much coffee, Gertrude," said Esprels' servant Bernard.

"I tell you that I saw them tear past me like speed-demons on the race track," Gertrude shrieked.

"What are you holding in your hand?" Bernard asked.

Gertrude looked down and noticed to her amazement that she was clutching a crumpled sheet of paper.

"Come on now, tell us what it says," Bernard ordered. Gertrude meekly obeyed.

"My dear Gertrude," she read. "Please take good care of the house and answer all the questions that people will ask you. Don't worry about me or my son. You will probably not see us for a long time, but I will double your salary for the time that we are away. Noroy."

"Congratulations," said Bernard. "You sure have a good master. Ours doesn't. . ."

"Listen!" interrupted Esprels' housekeeper. "I think I hear someone moaning."

All three cautiously approached the door and looked out into the night. Gooseflesh rose on their arms as they heard a very distinct, eerie moaning sound which seemed to come from the sky!

GERTRUDE did not hesitate long. Either out of the stubborn affection which she bore for her master or out of the devilish curiosity which was at the bottom of most of her enterprises, she leaped into action . . .

"Take these lights," she ordered, "and let's go see who is there."

"Suppose it's a trap," Bernard said.

Gertrude shrugged her shoulders, picked up a long flashlight, and ran out into the dark garden. Esprels' servants reluctantly followed her.

They found the garden deserted and the garden gate open. Out on the road they saw the dark silhouettes of two cars whose lights were off and which had apparently been abandoned. The three servants did not limit their search to the ground. After rapidly exploring the garden they raised their flashlights and looked toward the sky in an effort to discover the origin of the plaintive cries and muffled curses that

continued to come from that direction. The young leaves of the trees were still sparse and they could see right to the very tops of the oaks in Noroy's garden . . . The trees bore unusual fruits! A half-dozen badly bruised and battered men! Several of them were clutching the branches and trying desperately to reach the trunks in order to slide down to the ground. The others were hanging from the main branches, their heads, arms, and legs swinging grotesquely in the wind. One after another they fell heavily to the ground. Soon four or five men lay frightened and motionless on the grass. As the three servants rushed over to them, the bewildered men, blinded by the bright light of the flashlights, hid their faces.

"Where do you come from?" Gertrude asked.

A tall and powerfully built youth, who had just slid down the gnarled trunk of one of the tallest trees, answered her in a weak voice.

"You know very well where we come from, you witch!"

"Don't talk to me like that," shrieked the old servant. "I'll have you thrown out of here!"

"O.K., O.K.," the young man growled. "Just let us leave peacefully. We're not looking for trouble."

"I should like to see," Gertrude shouted, "if you . . ."

"Shut up, Gertrude," cautioned Bernard. "There are only three of us. Let's not get into a fight."

But the old woman was beside herself with rage. Certain that the intruders were practical jokers, she cursed them fiercely and in her anger pushed them, staggering and bewildered, toward the gate. Esprels' servants watched with amazement as she prodded into submission men who were many times more powerful than she was. She obliged those of them who had regained their presence of mind to lift their inert companions from the trees and to carry them out of the garden on their shoulders. She herself helped carry them to the ditch bordering the road. When the gate finally closed behind the last of the intruders she carefully searched the garden once more in order to ferret out any other unwelcome visitors who might still be lurking in the darkness. Then she ran back into her kitchen and burst into tears.

As Noroy dragged Esprels toward his garage, he saw in his garden a tall and robust youth holding a gun. The young man remained glued to the spot with astonishment when he saw the two scientists, looking very much like disembodied spirits, glide swiftly toward him in the moonlight.

Noroy and his collaborator, it will be remembered, were going about their affairs with considerable speed. They were, to be sure, moving far less swiftly than a speeding arrow and were therefore visible; but they bore down on the stranger more rapidly than a galloping horse, and they were a terrifying sight.

The young intruder didn't budge an inch as they came to an abrupt stop in front of him. It was plain to see that he was expecting a violent collision—a collision, however, which did not happen. Petrified with fear, he was unable to bring his gun into play to shoot down the two scientists. Before the thug could regain his presence of mind Noroy grabbed him by the waist and threw him up into the air. Curiously enough, though he had swallowed only a very small quantity of hexo-etyro-molybdenum, the scientist's strength had nevertheless been enormously increased. As he shot up into the air he would-be murderer fainted and landed unconscious in the branches of a nearby oak tree.

The professor turned to meet his accomplices who were preparing to attack. The first one to reach him

was immobilized on the ground by an armlock, then hurled into the air. He landed at the top of another nearby tree, where he summoned his remaining strength and held on for dear life to the branches. The professor made short work of the others by means of strangle-holds, waist-locks, and various judo throws. As a parting gesture, he flung each of the stunned thugs high into the branches of his oak trees. Noroy, who knew his trees, succeeded in perching them all either on the forks or on the main branches of his oaks with diabolic skill.

Two cars were waiting on the road in front of the gate. In order to prevent his enemies from following him, Noroy smashed their headlights. Following this, he dragged Esprels to his garage, made him swallow a pill B of H.S.M., and then downed one himself.

A few moments later the two scientists were racing along the road to Paris.

"Where are we going?" asked Esprels who was astonished to note that he was none the worse for his exciting adventure.

"To the home of Jules Marandon." Noroy replied.

THE entrance to the cité Vaneau, where Jules Marandon lived, was barricaded by a cordon of police.

My God, thought Noroy, can they have taken my old friend home and thereby exposed him to new dangers? I must get past these guards and at the same time keep out of sight. "Swallow this pill, Esprels!" he ordered.

A capsule A of hexo-styro-molybdenum permitted the two men to move once more with an incredible speed; and as Noroy had not hesitated this time to use the full dose to which he was accustomed, both he and Esprels became immediately invisible.

"You'll be the death of me yet," groaned Esprels as they passed by the immobile guards.

"Don't worry," Noroy retorted. "You took the first pill without suffering the slightest ill effects. Rest assured that this one won't hurt you either."

They found other policemen standing guard at the entrance of the building in which Marandon lived. They swallowed a pill B of H.S.M. to return to the normal rhythm of life only after arriving on the landing on which the stricken chemist's apartment was situated.

Gilbert opened the door for them.

"What's going on here?" asked his father.

"Lina has been kidnaped, dad," the young man answered in a toneless voice.

How were they to get Lina back again?

How were they to defend themselves against those who wanted to appropriate Marandon's secret.

How were they to recover the stolen documents?

Certainly Noroy could have answered the last of these questions, but for reasons of his own he refrained from doing so. To cheer up his friends, however, he smiled optimistically and offered them words of encouragement. He assured them that the stolen papers would soon be in Favre-Perronnet's hands, and that Lina Esprels, whom the enemy was holding as hostage, was for the time being in no danger. He also assured them that they had in their possession a powerful weapon which could be used either in their defense or to attack their foes. For, after all, didn't they have at their disposal a large supply of hexo-styro-molybdenum?

"What is hexo-styro-molybdenum?" asked Jean Thévenet.

Noroy rapidly informed Marandon's nephew of the nature of his discovery.

"The bodies of this pen and pencil are really simple tubes which contain my pills," he added. "The A pills are pink and the B pills are blue. The frames of my eye-glasses, which are hollow, are also filled with pills, as well as this object which looks like only a cigarette holder.

"Allow me, Esprels, to give you this pen. Take the pencil, Jean, and you, Gilbert, the cigarette holder. You are going to try out H.S.M. as soon as possible. First, however, let us draw up our plan of attack.

"Will you allow us to stay here temporarily, Jean? I know that your uncle would not have refused us."

Marandon's nephew hesitated for a moment, then nodded assent.

"No one knows that I am here," Noroy continued, "and I think it likely that Rides' men or Altkim's or Falkenberg's or Walker's will not come back. Furthermore, we are well protected by the police cordon which is guarding the street and the building. You certainly left no stone unturned, Jean."

"You're not going to reproach me for calling the police, are you?" Thévenet retorted. "My uncle was carrying out important experiments on perfumes here. I think that I've found most of the notebooks in which he jotted down the results of each day's work, but I feel that it is impossible for me to guard them by myself. I called General Favre-Perronnet and asked him for protection. You can't blame me, can you, because he did things in a big way?"

"Did Perronnet's investigators also give the apartment the once-over?" Noroy asked in a bantering tone.

"Of course."

"That's fine, my young friend! Now I am certain that we can remain here without fear of being disturbed. Seeing that General Favre's men have already looked the place over, I feel sure that no one else will be calling at our door. The apartment is now a perfect hide-out for me."

"I'm delighted that you're staying," Jean Thévenet said dryly. "I think that everything is in order now. Shall I show you to your room?"

"Not before we've decided what we'll do to save Lina," rejoined Gilbert Noroy.

"Leave that up to me and have faith in me," the professor ordered. "Go to sleep now, son. And you too, Esprels."

Gilbert cast a desperate look at his father.

"Come now, son, take heart," the scientist said gently. "Don't ask me any questions. Everything will be all right. Before this day is over I am going to carry out some plans that I have in mind, and then..."

"Then?"

"I shall throw myself into the lion's jaws!"

NOROY had found a perfect hide-out at the cité Vaneau. The apartment house in which Marandon lived was in a state of siege. If Rides and his allies tried to again break into the chemist's apartment they would certainly have been stopped by the police.

"I sent the portfolio to Favre-Perronnet," said Gilbert Noroy. "The servants will not leave the apartment. Only Marandon's old valet, who can be trusted, according to Jean Thévenet, will be allowed to go out. I will attend to the telephone. Thus no one will know that you and Esprels are hiding out here."

"Good work, son," answered Noroy. "I want you and Jean Thévenet to get used to the effects of hexo-styro-molybdenum. Especially the modified form I have perfected, which has negligible after-effects. In

the days to come I will need your help. Furthermore, from now on you must listen carefully to all news broadcasts. A message from Favre-Perronnet will be sent to me by radio. It contains only three words: 'Good news, Noroy!' As soon as you have heard this message, you must contact me immediately, even if . . ."

The ringing of the telephone interrupted the professor. Instinctively he reached for the receiver.

"Stay away from the phone, dad," Gilbert ordered. As the professor drew back, the youth lifted the receiver to his ear.

"Hello," he heard. "This is Samuel Rides. Is Professor Noroy there, please?"

Gilbert was so surprised he was unable to answer immediately.

"I don't know where the professor is," he replied after regaining his presence of mind.

"Really? Well, I know where he is," Rides answered. "I appreciate your discretion, Monsieur Gilbert. Goodbye."

"Rides knows you are here," the young man said as he put down the receiver.

"At least he claims to know where I am," answered Noroy, hanging up a second receiver. "I wonder who could have told him."

"No one has left the apartment since this morning except Marandon's valet who doesn't know you, but . . . Oh no! That's impossible . . . Jean Thévenet made a call. But what would he gain by telling Rides?"

"Don't be silly! If, for some reason or other, Marandon's nephew wanted to get rid of me or to get me into trouble he would only have to tip off Favre-Perronnet that I am here instead of turning to foreign agents who are in hiding and whom he would have difficulty in contacting if he were not working hand-in-hand with them for a long time. Rides' intervention is inexplicable. That Englishman is a smooth operator and he would never have called if he knew that he were making a mistake . . . Well, let's not give him another thought. Do you know—I'm hungry? Didn't we forget about lunch today?"

GILBERT prepared to down his first pill of H.S.M. toward the middle of the afternoon. The young medical student had mentally braced himself for the effects of the marvelous drug which his father had invented. He knew the absorption of the astonishing accelerator would produce no ill effects upon his powerful constitution.

It was while strolling along the boulevard Saint-Germain that he swallowed the small pink capsule which was calculated to multiply his mental and physical powers by an enormous coefficient. As the pill took effect he was frightened to see traffic come to an abrupt standstill; the noisy vehicles on the street were suddenly choked into absolute silence . . . There was no sudden screeching of brakes . . . no cries of fright . . . just silence! Turning his attention to the people who were walking on the sidewalk he was amazed to see that they too had come to a full stop and were standing immobile in their places. Gilbert was disturbed by something and he wondered what it was. He soon realized that movement was not entirely lacking from the gigantic living picture which met his gaze. A living picture . . . yes, that's what it was . . . all these seemingly motionless people continued to live, and yet they appeared to have been cast under a spell which had silenced and paralyzed them.

The hair and scarf of a girl, who was sitting in an open car, continued to stream in the wind—as if the

wind were still blowing—and yet both hair and scarf were no longer moving. A cyclist, sitting on his bicycle in the middle of the street, was visibly pressing upon the pedals with all his strength; for all his efforts, however, the bicycle didn't budge an inch; it remained miraculously motionless and upright in its place. A man was roaring with laughter on the terrace of the Café de Flore and his laugh, Gilbert thought, seemed never to end. The red light had stopped all the traffic coming from the south by way of the *Rue de Rennes*. Gilbert scanned the Boulevard Saint-Germain where the green light mutely informed the assembled cyclists and motorists that they now had the right of way. To his amusement and amazement, the cars, trucks, and bicycles which jammed the busy thoroughfare stood silent and motionless as if held back by some invisible power.

All animals and objects seemed to have been cast under the same spell. A piece of paper which was drifting in the wind had its course interrupted and remained suspended in mid-air. The sparrows in the nearby square seemed to hover interminably over some crumbs of bread which were scattered on the ground. And a flock of pigeons, preparing to swoop to the ground, lingered, with outspread wings, near the belfry of the Church of Saint-Germain.

Gilbert, somewhat frightened by what he saw, decided to restore this petrified world, and hastily crunched a pill B of H.S.M. and swallowed its contents. Immediately, time resumed its familiar rhythm. The pigeons continued their flight to earth, the sparrows pounced upon the coveted crumbs, and the paper was carried away by a strong gust of wind. The vehicles, which jammed the Boulevard Saint-Germain, tore off once more, and the cyclist, whom Gilbert had observed a moment before, raced down the avenue and was quickly engulfed in the thick traffic. The man in the Café de Flore briefly continued his boisterous laugh, and the girl, whose scarf and disheveled hair were streaming in the wind, drove swiftly away and was soon out of sight.

The film of life rolled on without further interruptions.

Gilbert Noroy repeated his experiment several times during the next hours. Each time he took pleasure in seeing the world around him suddenly immobilized and cloaked in silence. Thanks to H.S.M. he saw the water, which was streaming toward the sky from the fountain in the Luxembourg Garden abruptly freeze in its place and remain motionless in the air, looking very much like the stem of an enormous flower which was about to burst into full bloom. The geyser stopped climbing without the slightest tremor, and the shining sheets of water which were preparing to fall back into the basin as drops no longer observed the laws of gravity. A heavy and sudden frost would have produced the same effect.

Gilbert caught a tennis ball as it sped across the court and stuffed it into his pocket. Then he noted with amusement the astonishment of the player who saw the ball, which he had whacked with all his strength, disappear like a soap bubble. When the tennis players saw their ball roll along the court a few seconds later, they were certain that they had been the victims of hallucination!

Next Gilbert entered the well-guarded Luxembourg Palace without the slightest difficulty, strolled into the chamber where the Senate was in session, and mingled with the statesmen who were patiently listening to an orator who was standing silent and immobile with his arms outstretched and his mouth hanging wide open.

Senator Blonderville, the president of the Senate

and a friend of Professor Noroy, was presiding over the meeting. A thick notebook lay on the desk in front of him. Gilbert liked the old man, who sometimes teased him affectionately, reproaching him for his laziness and his bad handwriting. The young man picked up a pencil and wrote these words on the cover of the notebook:

"Greetings and best regards from Gilbert Noroy, who dropped in to pay his respects to you, dear sir, and to this august body. Signed Gilbert Noroy."

Then he left the chamber and visited the palace's magnificent library and the former bedroom of Marie de Medici, which was now a tobacconist's shop. After satisfying his curiosity, he left the building by way of the door which opened on the Rue de Vaugirard.

Familiar at last with the effects of hexo-styromolybdenum, he was ready to call it a day and return to Marandon's home when his attention was suddenly caught by the strange attitude of several passers-by at the corner of the Rue Camille-Desmoulins and the Boulevard Saint-Germain. Still under the influence of the dose A of H.S.M. which he had swallowed a few minutes before, Gilbert sauntered over to the small group of men and women who seemed to him to be standing as silent and immobile as statues. He noticed that their faces were convulsed with fear and that they were excitedly pointing to something above them. Looking up, he saw a terrifying sight: a three- or four-year-old boy was suspended motionless in mid-air! The tot had fallen out of the fourth-story window of an apartment house and was plunging headlong toward the sidewalk. The horrified mother was bending over the window sill. Her outstretched hands frantically clutched at empty space and her face wore a desperate and hopeless look. Only a miracle could save her son from death.

At the moment when Gilbert arrived at the scene of the impending accident, the child was still some two stories from the ground; the speed of his fall, thanks to H.S.M., seemed nil. Gilbert had all the time he needed to enter the apartment house, slip by the petrified *concierge*, and climb to the second floor.

On reaching the second floor he ran into difficulty. The solid oak door of the apartment, which he wanted to enter, was locked. Gilbert did not hesitate: with a tap of his finger, which had been transformed by H.S.M. into a powerful battering ram, he smashed both the lock and the door. He found himself now in the ante-room. Through an open door he saw a woman standing motionless with a knife and a potato in her hands; a man was reading his newspaper. Both were looking uneasily toward the open window from whence there came a clamor of shouts and cries. Outside the window something was hovering in the air: a child whose eyes were popping out of their orbits and whose little blue pinafore was stretched out behind him.

The child wasn't far from the window. Gilbert leaned out, grabbed the boy by his pinafore, and took him carefully into the house. Realizing that one wrong move on his part might kill the little boy, he held him gently in his arms. The child was motionless; his breathing and heartbeat were almost imperceptible. But Gilbert knew from the touch of his warm and supple flesh that he was alive and perfectly all right. A moment later he carried the baby out of the apartment, went down the staircase, playfully plucked a hair from the mustache of the still petrified *concierge*, and left the building. After placing the child gently on the sidewalk, he moved about ninety feet away, and swallowed a capsule B of H.S.M.

As the drug took effect, Gilbert was almost deafened

by the racket in the street. Shouts, screams, and the sound of screeching brakes were everywhere to be heard. People were converging on the scene from all directions. The onlookers rushed toward the motionless little body, as though rushing could have helped matters any! As each reached the child they shouted wildly with relief and with incredulous joy:

"He's alive! . . . alive! . . . I tell you he's alive!"

"Why, he hasn't even got a scratch!"

"It's impossible . . . It's a miracle . . ."

"He's alive . . . alive . . . alive . . . !"

"He didn't even break any bones, lady!"

As the little boy rose to his feet, sobbing women hugged and kissed him. His mother disappeared from the window, ran down the stairs, and dashed to her child. Mad with joy and still trembling with anguish, she tearfully blessed the invisible power that had saved her baby's life.

WHEN my father hears the story of this rescue, Gilbert thought as he slipped away from the scene, he will be very happy that he discovered hexo-styromolybdenum. After all, I didn't run any risks. It was dad who saved this tot's life. I am sure H.S.M. has immense potentiality for good.

Jean Thévenet was working in his room and he received his friend rather coolly. No, he had not had the time to try out his pastilles of H.S.M. He had spent the whole afternoon classifying his uncle's papers and putting them in order. As a matter of fact, he no longer knew where he had put the hollow pencil that contained his supply of the drug.

To cheer him up, Gilbert Noroy told him all about his walk in Paris. As he related the more unusual and thrilling aspects of his story, Thévenet's eyes lit up and he excitedly decided then and there to try his own luck with hexo-styromolybdenum.



"The child wasn't far from the window."

"If I only knew where I put that confounded pencil," he growled.

And he began to look for it in all the rooms of the apartment. As he walked through his uncle's study he saw Noroy's eye-glasses lying on the desk. He suddenly remembered that the professor had told him that the frames of his eye-glasses were hollow and contained some capsules of H.S.M. He walked up to the desk, pilfered a pill, and hastily swallowed it. As the pill took effect he chuckled at the thought of playing a trick on Gilbert in the next room.

A moment later, however, the poor fellow stopped smiling. What he saw made him think that he was going mad!

The door of the study opened suddenly and Gilbert Noroy bounded upon him and shook him frantically. Then the professor appeared in the room. He was moving with such an extraordinary speed that Thévenet remained frozen in his place. The frightened young man remembered having seen movies in which the actors, by virtue of trick photography, moved so quickly that it was difficult to follow their actions. This spectacle was certainly nothing like the one which Gilbert had promised him. Thévenet was so shocked that he lost consciousness.

Before he fainted, however, he realized that he was sitting and that Noroy, Gilbert, and Marandon's three servants were dancing a fantastic ballet in which he was reluctantly taking part. They dragged him into his bedroom and undressed him in the twinkling of an eye.

He came to immediately, or at least so he thought, and saw Noroy's kind face bending over him.

"What's going on?" he asked. Before answering, the professor pulled up a chair and sat down at his bedside. Thévenet noted with satisfaction that there was no longer anything abnormal about the scientist's movements.

"What you mean to say is: What happened?" Noroy asserted.

"As you wish," Thévenet replied without understanding why the professor had corrected his remark. "I just swallowed this very moment one of your confounded pills and . . ."

"Pardon me, my young friend, *that was yesterday.*"

"What's that?"

"You heard me . . . you swallowed that pill yesterday . . . and you've been in a bad way ever since!"

"But how can that be? It was just a quarter of an hour ago that . . ."

"No, my boy. The little drama, which just ended, lasted more than twenty-four hours. It was quite foolish of you, you know, to swallow one of the pills which were contained in the left-hand side of my eye-glasses. You absorbed a considerable amount of negative hexo-styro-molybdenum. In other words you took a drug which slowed up your organism instead of accelerating it. Negative H.S.M. brings your body to an almost complete standstill and compels you to remain immobile while the world around you goes normally about its affairs. While under its influence you think that time is flying at an incredible speed: the hours seem to you to be minutes and the days, hours . . . As a result all those around you appear to be moving with inconceivable rapidity.

"When my son went looking for you in Marandon's study, he found you on your feet, completely disconcerted and incapable of making the slightest gesture. You can imagine how surprised and frightened he was . . . He called me immediately and I guessed rather easily what you had done. *The effects of negative H.S.M. last twenty-four hours.* Since there was

actually nothing that we could do for you, we carried you to your room and put you to bed. Now, after having lost the notion of time for one full day, you're perfectly all right again."

Completely taken aback, Jean Thévenet mulled over Noroy's words for some time. Then he got out of bed and exclaimed:

"But for heaven's sake, will you please tell me how this diabolic drug can be of use to mankind?"

"You will know in good time. I think a bath will make you feel like yourself again. I'll see you later."

"The unfortunate experience of our young friend has considerably delayed me," Noroy said to his son a few moments later. "But don't worry, I shall make up for lost time."

"Jean is always throwing a monkey wrench into the works. Because of his stupidity, we have been unable to look for Lina for twenty-four hours."

"Please Gilbert! Take courage! Every time you mention Lina's name I see Esprels crying and begging me to get her back."

"Are you taken in by the tears of that old crocodile?"

"Gilbert!"

"Pardon me, dad, but I don't think that a great affection bound them . . ."

A harsh whistling sound interrupted the young man—a whistling sound which was followed by an anguished call for help!

"Monsieur, Monsieur, a terrible thing has happened!"

Both men rushed out of the room. Glancing rapidly around them, they saw that the front door of the apartment and the door of Jean Thévenet's bedroom were wide open. Outside Thévenet's room Marandon's old valet was standing wringing his hands.

"Monsieur Jean had just put on his clothes," the trembling old man whined. "He was drinking this glass of water which I had brought him, when all of a sudden he disappeared."

Noroy quickly explored Jean Thévenet's bedroom. Then he dashed into Esprels'. Finding both rooms empty, he hurriedly searched the rest of the apartment with the help of Gilbert and Marandon's three servants. The investigation, however, was in vain. Both the Swiss scientist and Marandon's nephew were gone!

Noroy and his son didn't continue their search long. It was clear that Jean Thévenet and Esprels had disappeared at the same time. The policemen on guard outside the building told Marandon's servant that no one had left the apartment. Furthermore they had seen no one answering either Thévenet's or Esprels' description leave the building. Noroy was now certain that the shrill whistling sound, which he had heard a moment before the old valet's cry for help, meant only one thing: Both Thévenet and Esprels had taken hexo-styro-molybdenum in order to escape without being seen.

"I have found Jean's notebook," said Gilbert Noroy. "It's the notebook in which he jots down the important details of his daily experiences. Obviously we would be indiscreet if we were to read it, but I am sure that it would give us some clues."

"We'll dispense with discretion and read these notes," Noroy decreed. "A man's life, and perhaps even Lina's, may hang upon what they contain. Give me the notebook."

"Noroy and Esprels dropped in unexpectedly," Jean Thévenet had written on Friday, the third of May. "The professor told me about a powerful accelerator which he invented. His story seemed to me to be

ridiculous and absurd, but I spoke with such sincerity that I am forced to admit, after thinking things over, that he didn't lie to me. And if he didn't lie to me . . . I can understand all the unusual events which filled my last trip from Paris to Nice and back. I can also explain the disappearance of Marandon's documents in the very heart of the *Dodecagon*. Truly I did well to distrust Noroy. Fortunately, however, there are other copies of the stolen documents and I know . . ."

The last page, upon which Thévenet had written, contained nothing more.

"Don't you think it strange that he left his notebook behind when he skipped out of here?" said Noroy. "Why would he have wanted to let me know what he really thinks of me? And if he distrusts me, why does he tip me off that there are copies of the documents containing Marandon's secret formulas? Believe me, Gilbert, your friend Jean didn't leave his notebook here voluntarily."

"Come on now," the young man retorted. "You know very well that Jean takes pleasure in mystifying his friends. In any event, I know almost nothing about the trip from Paris to Nice which he refers to."

The professor thereupon gave his son the information he wanted, and further informed him of what he had done at the *Dodecagon* to prevent Rides from benefiting from Marandon's discovery.

"We must now suppose that Thévenet told Rides that I was here," he added. "From now on we must assume that your friend is in league with our enemies. It is entirely possible that he has a copy of Marandon's formulas which he plans to hand over to them. Moreover, I wouldn't be a bit surprised if he forced Esprels to go along with him."

"Why would he have burdened himself with him?" Gilbert asked.

"He knows that Esprels took part in all my experiments. My hexo-styro-molybdenum also interests him, and he intends to kill two birds with one stone: He will deliver both Esprels and Marandon's invention to our enemies. And, as if things were not bad enough, we ourselves will soon be in a spot if we stay in this apartment too long. Marandon's servants will not fail to tell the police of the disappearance of their master and his guest, and the police will take us in for questioning. Rides and his accomplices are certainly making things tough for us. Nevertheless, come what may, I must remain in Paris for at least another twenty-four hours."

Gilbert, who had a vacant stare on his face, said nothing.

"Are you listening to me?" his father asked.

"Certainly, but I'm trying at the same time to figure out why Jean didn't finish the last sentence in his notebook. If we could only guess what he wanted to say, we might have the answers to a lot of questions."

"If . . . If . . . that's a perfectly useless word, son. Let's stick to the facts, and to the facts alone."

The conversation continued for more than an hour. Noroy gave Gilbert instructions how to use the various types of hexo-styro-molybdenum and told him to calm the servants by informing them that Jean Thévenet and Esprels would soon return. Then the professor shut himself up in Marandon's study and prepared his plan of attack in detail.

That morning President Blonderville wasn't at all pleased that he was the second most important person in France. His duties were weighing him down and he felt very tired.

Why, he wanted to know, had he suddenly become so nervous and depressed? . . . Was it because of the

practical joke which had been played on him the day before? Certainly not . . . Nevertheless, he had to admit that the astonishing message, which had suddenly appeared on the cover of his notebook during the speech of Senator Chardon, had bowled him over.

President Blonderville succeeded at length in forgetting his personal problems, and he set to work. Grimly he surveyed the reports lying on his desk—reports which told of strikes, skyrocketing prices, and threats of war. While he was studying a report dealing with a railway strike, the telephone rang. Someone was calling him on his private wire.

"Hello, this is Noroy," he heard.

"I'm glad you called," Blonderville replied in a warm and friendly voice.

"May I see you today, Blonderville? I don't want to reproach you, but you've been putting me off for more than a month now."

"Come right over, Noroy! I shall be happy to see you! I'm sorry that we couldn't get together these last few weeks, but I've been frightfully busy . . . Well, we'll talk about that when you get here . . . See you soon!"

President Blonderville was already feeling better as he put down the phone. At last he would get some answers to his questions. After all, he thought, his health wasn't so bad . . . but why were his ears ringing like that? What in heaven's name was making that confounded whistling sound? He raised his eyes toward the open French windows that faced the garden and noticed with surprise that one of the tulip curtains, which the fresh morning breeze had blown in his direction, was torn. A slight noise on his left made him turn his head; what he saw nearly made his heart stop beating. First he became deathly pale—then his face turned a deep red. He wanted to cry out, but his vocal cords were nearly paralyzed and it was all he could do to utter a smothered groan. It was, indeed, only with the greatest difficulty that he lifted his hand to his brow, now covered with sweat.

NOROY was standing before him.

"Calm down, my dear President," the professor said to him. "It may seem fantastic—my sudden appearance—but I thought that it wouldn't be a bad idea to scare you a little. Please don't be angry with me. I really meant no harm. I just telephoned you from the post office at the Rue de Vaugirard. As soon as our conversation was over I came here as quickly as possible. I avoided your secretaries and guards by entering through this window."

"This is above my comprehension," Blonderville stormed. "Yesterday it was your son and today, you. By the way, do you know that Gilbert played a joke on me that I didn't appreciate at all . . . Listen . . ."

"You needn't go on, Blonderville; he told me the whole story. Yesterday, while you were supervising a debate in the Senate chamber he wrote a few words on the cover of your notebook. What's more, he wrote these words under your very eyes."

"And I didn't see him?"

"And you didn't see him . . . At that moment he was moving at a tremendous speed, just as I do whenever I feel that I have something important to do."

The telephone rang again. Blonderville answered.

"Why, no, my dear Bouquès, I am not in any danger . . ." he said. "You sound very nervous . . . Yes, you may come in if you want to."

Then he hung up and turned to Noroy with a stupefied expression on his face.

"My secretary says that some extraordinary events have taken place at the entrance to the palace. He believes that my life is in danger and he wants to see me at once. With your permission I'll see what this is all about."

Noroy nodded assent. A few seconds later Blonderville's young secretary, Pétros Bouquès, entered.

"Monsieur President, someone just knocked down two of the guards at the entrance to the palace. They can't describe him, because, strange though it may seem, they didn't even see him. We have every reason to believe that the man came into this wing of the building. The concierge, who was at his post, noticed nothing; nevertheless the alarm has been sounded and you are now safe. By the way, sir, here's something that belongs to you."

"Good Lord, my paper-weight! . . ."

Bouquès was holding a massive, gilt anchor which the President of the Senate regarded as his good-luck piece.

"I can't tell you how this object got on my desk, Monsieur President. But I could swear that I saw it suddenly appear near my phone when I called you a minute ago."

"What nonsense is this you're telling me?"

"Your secretary is giving you an exact account of what he saw," Noroy said. "I can not only confirm his remarks, but I can also explain this phenomenon to you."

Puzzled by Noroy's words, Bouquès moved closer.

But Blonderville, unwilling to share his friend's revelations with anyone, dismissed his secretary, who left the room with a fallen countenance. A moment later the elderly senator looked around for his anchor in order to put it on the right side of his desk. To his amazement he was unable to find it.

"That blundering young fool must have taken it back with him," he growled while scattering his papers around him. "I could have sworn that he had placed it in front of me."

His ears began to ring again. Would that infernal whistling sound never stop?

"Do you see the anchor, Noroy? . . . Noroy! . . . where the devil are you?"

"Right here at your side, my dear President."

Blonderville, who was looking to his left, brusquely turned his head toward the right.

"How did you get over there? I didn't even see you move!"

The ringing of the telephone prevented Noroy from answering.

"An incredible thing has happened, Monsieur le President," shouted Pétros Bouquès. "When I returned to my office I found on my armchair the paper-weight which I returned to you not a minute ago!"

"You took it back with you, without realizing it, my good friend. Bring it here quickly."

When Pétros Bouquès entered the Presidential office once more, his face was pale and drawn. He was visibly racked by the desire to know who might be the practical joker daring to make a fool of him.

"Listen to me Blonderville," Noroy said, when the secretary had left the room and the anchor was once more in its place at the right of the President's desk. "Listen carefully. I see that you are disconcerted and frightened like all those who meet with a strange experience. Pull yourself together! You aren't going out of your mind. Gilbert really wrote those words on your notebook, and I really came here in the twinkling of an eye after our

telephone conversation. It was I who clumsily knocked down the two guards who were standing at the entrance to the palace. To convince you of my powers—I stole your paper-weight and placed it on the desk of your secretary, whose office is on the same floor. I did even better than that. When our good friend Pétros Bouquès returned your anchor, I picked it up and carried it back to his office—which is about ninety feet from yours—in a fraction of a second. Small wonder that the poor fellow was so surprised to see it on his armchair! To make a long story short, I am endowed with a power which may seem supernatural to you, but is really nothing of the sort. Any robust man can do the same thing I did. All he has to do is to make use of a product which I had the good luck to discover. The name of this product is hexo-styromolybdenum. . . . Perhaps General Favre-Perronnet has told you something about it."

"You know very well that Favre-Perronnet and I don't get along. If he can help it, he doesn't confide anything to me."

By now Blonderville had regained his self-possession. Noroy's reassuring words had set his mind at rest. He now realized that anyone who was not aware of what the professor's remarkable drug could do would be terrified on seeing a spectacle like the one he had just witnessed. He leaned back in his chair and listened to his friend, calmly but intently.

"Here is a duplicate of a report which I sent to Favre-Perronnet. It concerns H.S.M. as well as Marandon's invention. You are aware of the significance of that invention, aren't you?"

"Andrien, the prefect of police, told me something about it yesterday," answered Blonderville. "Is Marandon's discovery really so important?"

"It is vitally important," affirmed Noroy. "You'll see why when you read my report."

Blonderville scanned the first pages of the report rapidly. Before long, however, he was fascinated by the strangeness of the professor's story, and began to study each of the remaining pages carefully, interrupting his reading from time to time to ask numerous questions. Noroy's answers were short and clear and at length convinced the elderly senator that the problems which were discussed in the report had to be solved as quickly as possible. Blonderville solemnly promised the scientist his complete support.

"MONSIEUR GILBERT left a while ago in a hurry," the valet said to Noroy who had just returned to Marandon's apartment.

Noroy wondered why his son had not waited for him as he had promised. A moment later, however, he dismissed Gilbert from his thoughts. He wanted to devote a good part of the day to Jules Marandon. He ate his lunch rapidly and alone and then at 2 o'clock dialed the number of Doctor Stanislas Varik of the Academy of Medicine, who was the head doctor of the *Dodecagon*.

"I'm glad to hear from you, Noroy," Varik affirmed. "Where are you calling from?"

"Allow me, doctor, not to answer that question and to pat myself on the back for not having telephoned you from the *Dodecagon* where you could have traced my call."

"What's eating you, Noroy? I'm not a member of the police. What can I do for you?"

"Tell me how Marandon is getting along. Give me all the details—just as if you were talking to another doctor."

"Pulse 80; temperature 102. He is no longer in a

coma, but has not recovered his lucidity . . . There are indications of Babinski's disease . . . All of which means that our patient is suffering from an organic lesion, the extent of which has yet to be determined. We must further discover whether it is reversible or not. I have prescribed a vasodilator, a long rest, barbiturates . . . Do you want any other details?"

"I want you to listen carefully to what I am going to say, Doctor. Tomorrow you will receive a letter from me accompanied by a little package. I know the disease from which Marandon is suffering, and I am going to send to you a remedy which I had the good fortune to discover. It is called negative hexo-styromolybdenum. I will attach to this letter a report concerning this drug which will tell you all about its remarkable properties. I assure you that Marandon will benefit from my compound. It will help him get the long rest which you have prescribed for him and it will help cure him."

"You are not a doctor, Noroy!"

"I know, but I could have been, Varik . . ."

Without further ado, Noroy abruptly hung up.

Having drawn up the letter and the report and sent them off along with the special pastilles of H.S.M., Noroy peered out the window and noticed that the afternoon was drawing to a close. Gilbert still had not come home.

"If he were free to come and go at will, he would at least have telephoned me," Noroy thought to himself. "I don't know whether his absence is a good or a bad sign. I wonder where he can be?"

The professor didn't have to think long about this question. Toward 5:30 the telephone rang.

"Hello, this is Otto Falkenberg," Noroy heard. "I think you can consider yourself licked, my friend."

"What do you mean?" the scientist calmly asked.

"Your son has fallen into our hands. Consequently I advise you to change your attitude toward us. If you don't stop meddling in our affairs, we'll put him out of the way. You wouldn't want your son to pay for your indiscretions, would you?"

"You may do with him as you please," Noroy replied. He promptly hung up.

His son . . . with the H.S.M. on his person! He smiled.

A few seconds later, the telephone jangled again. Noroy burst out laughing at the thought of Falkenberg's ugly, tormented face. His only regret was that he had not been able to throw *himself* "into the lion's jaws."

IT WAS 10 p.m. when Noroy, at his listening-post near the luminous dial of Marandon's radio, heard the fateful words:

"Good news, Noroy!"

The announcer paused, then continued:

"We repeat: 'Good news, Noroy!' We hasten to add, ladies and gentlemen, that this a personal message. Please don't pay any attention to it . . . Next you are going to hear . . ."

The telephone began to ring and Noroy immediately turned off the set. Who could that be? Some nuisance who would hold him up at a time when he had to swing quickly into action? Should he call his servant and ask him to answer?

A sudden foreboding made him brush aside this idea, and he grabbed the receiver. At first he heard

only a harsh buzz. Then the static died out and he recognized the voice of his son.

"Is that you, Gilbert? . . . Where the devil are you, my boy?"

"I am about 450 miles from Paris . . . at Cassis in the Bouches-du-Rhône. Come as quickly as you can. I need you badly!"

"As quickly as I can? Is it really necessary? At the moment I can't do as I please with my time."

"It is absolutely necessary. I can't speak to you any longer on the phone. Take a plane to Marignane, then proceed by car. I shall wait for you tomorrow at 10 a.m. at Cassis in the lobby of the Hotel Regresco. So long, Dad; I can't wait till you get here."

Noroy sighed. "See you tomorrow, Gilbert."

The professor hung up, then called the airport.

Having made a reservation to Marseilles, he dialed this time an ultra-secret number—the number of General Favre-Perronet.

"Yes," Noroy said, "I want to speak to the General himself."

The scientist heard Favre-Perronet pick up the phone and growl a few words.

"Yes, General," he replied, "it is indeed I. You see that I didn't waste any time in answering your call . . . I know it's late, General, but I must see you at once. Our adventure is drawing to a close. I am going to ask you to . . ."

"To mobilize our forces?" General Favre insolently gibed.

"You've almost hit the nail on the head, General," Noroy gayly answered. "I'll be at your house in twenty minutes."

Between Marseille and Cassis, in the rocky deserts which are called the mountains of La Gradule, the coast of France is lined with bluffs which are steeper than those found on Easter Island. There is nothing more curious than seeing a populous city, whose broad avenues and boulevards are jammed with buses, trolleys, and various other vehicles, bump against a mountainous barrier and come to an abrupt end. Such is the case with Mazargues, la Madrague—almost the end of the world. There is no road to the sea, no smugglers' path. The highway to Toulon and the railroad tracks, which go from Marseilles to Italy, make a ten-mile detour near Aubagne. There is only one twisting mountain road—number 559—which begins at Sainte-Marguerite, climbs into the maritime Alps, then descends into the pass between Mount Carpiagne and La Gradule. It continues along a countryside which reminds one of Phoenicia and Asia Minor.

It is there, at the far end of the cove of Borgiou, that *Castelroc* was situated—Castelroc, the general headquarters of Falkenberg's gang, and if need be, their stronghold. Castelroc had been constructed in the style of 1900. It had pseudo-embrasures, sculpted

balconies, winding staircases, and twisted columns topped by little stone lions. But under these pseudo-baroque ornaments was hidden a framework of reinforced concrete. The gate of Castelroc would have resisted a tank; its deep underground cellar was connected with innumerable tunnels and caverns, which Nature had bored in the side of the cliff and which opened on a subterranean port where two powerful launches hugged the shore, ready to shove off.

On the terrace of Castelroc, Gilbert, his elbows



propped on the railing, was chatting with Lina Esprels. From time to time the Swiss scientist's daughter stroked the head of a nearby stone greyhound. The attention of the two young people was suddenly attracted by a huge devil-fish which was churning up the transparent waters in the cove below.

"What a horrible monster!" Lina said. "Do you think that it could eat a swimmer who got in its way?"

"Certainly not," Gilbert replied. "As a matter of fact, all you have to do to render the animal completely harmless is to turn its hood inside out!"

"How did you get here, Gilbert?" asked Lina squeezing his hand. "Were you also kidnapped by Falkenberg?"

"Kidnaped is the word," Gilbert replied. "They made off with me as easily as if I had been a child. As you know, my father and I were hiding out at the home of Professor Marandon. Dad went out to see someone and I stayed behind waiting for him to return. A half hour or so after he had left, the telephone rang and I heard a voice which sounded to me like that of our secretary: 'Your father has been injured in an automobile accident,' the voice said. 'It isn't serious, but he would like you to come to him at once.' 'Where can I find him?' 'He is at the clinic on the Rue Georges-Bizet. He is waiting for you.' The woman hung up. Doubtless I should have called the clinic to see whether she had told me the truth. Come to think of it, however, that wouldn't have helped me any, for in all likelihood one of her accomplices had been planted at the hospital switchboard in order to lure me into the trap.

"I left the house in a hurry. Seeing a taxi parked near the sidewalk some three houses away, I hailed it and climbed in. A second later I sensed that something was wrong and tried to get out. It was too late—the doors were locked! I heard a shrill whistling sound; then a white vapor enveloped me and I blacked out."

"These men are very strong," Lina murmured. "Correct," Gilbert rejoined, "and what's more, they are part of a large and well-organized gang. They took me clear across France by road and air without a hitch. To tell the truth Lina, I'll be hanged if I know where I am now."

"You're at Castelroc," replied Lina Esprels, "on the coast, near Cassis . . . It is impossible for you to get in touch with the outside world!"

Lina didn't know that Gilbert had deliberately exaggerated the story of his kidnapping. She didn't know that he could have escaped from his enemies without the slightest difficulty simply by using hexo-styro-molybdenum. Actually the young man had allowed himself to be kidnapped, certain that he could get away and contact his father whenever he pleased. For his part, Noroy knew that his son was in no danger. He further knew that Falkenberg had unwittingly taken his most dangerous enemy into his camp—an enemy who was practically invulnerable! That is why the professor had answered the arrogant German so boldly over the phone.

Confident that his captive couldn't escape, Falkenberg had not locked Gilbert up, but had granted him a certain amount of liberty within the walls of Castelroc. A few moments after his arrival Gilbert had seen the garden gates swing open to admit a powerful limousine. Quickly he had swallowed a capsule A of H.S.M., slipped out of the prem-

ises, and rushed to Cassis. On arriving in the town he had taken a pill B, strolled into a café, telephoned his father, and told him what had happened. Then, his report finished, he had downed another pill A and raced swiftly back to Castelroc. Between the time of his departure and that of his return scarcely five minutes had elapsed!

Upon his return he had found the garden gates securely locked. To enter his "prison" he had simply rung a bell on the adjacent wall and waited till the gates had slid partially open. Then he had walked right past the entrance guards who naturally didn't see him. Hexo-styro-molybdenum had once more rendered him an invaluable service!

"Do you know," said Lina, "that I am very happy to see you here? . . . I should say that I'm glad you're with us. Gilbert, because my father is here as well as Jean Thévenet and all the chemists of Aigopal."

"It's a small world," Gilbert replied laughing. "Do you know whom I met in one of the corridors? Rides and Walker! I spoke to them individually and they seemed to be in sympathy with our cause. I might even go so far as to say that they were friendly and understanding. But tell me—who is in charge here?"

"Officially, Castelroc is a psychiatric institution, a sanitarium for people suffering from severe nervous disorders. That explains the walls and the gates. The sanitarium is directed by a certain Gontcharow . . . who is actually an old friend of ours."

"And who is this old friend?"

"Altchim."

Gilbert remained silent for a moment, then placed his hand tenderly on the girl's arm.

"Lina," he began . . .

A harsh voice from behind cut him abruptly short.

"Come along with us, Noroy. We want to show you the room that the boss has assigned to you."

The young man wheeled about: two burly thugs wearing uniforms were sizing him up with their cold eyes. Since both men were armed with revolvers, resistance was out of the question. Gilbert squeezed Lina's hand reassuringly, walked ahead of his two guards, and stealthily slipped a pill A of H.S.M. into his mouth. Once in the building he turned suddenly into one of the corridors and swallowed the pill. Then he silently went down a winding staircase, passed through a number of long, arched corridors, and inspected the windowless vaults where vast quantities of arms and ammunition had been stored.

It was while exploring a subterranean passageway which was lighted by a star-shaped fluorescent tube that he suddenly found himself face to face with Samuel Rides . . . it would be more correct to say that he came upon the "statue" of Samuel Rides, because the Englishman, who had been petrified by the stopping of time, stood stiff and immobile in his place.

"Well, well, look who's here!" Gilbert chuckled as he swallowed a capsule B of H.S.M.

An instant later Rides was moving and breathing once more like a normal human being. He smiled on seeing Gilbert, for he had long suspected that the

Noroy, both father and son, knew of a method by which they could move at tremendous speeds.

"Hello, Gilbert. We meet again," the Englishman said, laughing. "Are you a friend or foe?"



"We're on neutral ground," he replied, stamping on the cement floor. "You are a very intelligent man, Monsieur Rides . . . Have you heard it said that rats always leave a sinking ship? I don't mean to compare you to a rat . . ."

"But it is an incontestable fact that Falkenberg's ship is sinking," said Samuel Rides. "Consider me your ally, Monsieur Noroy, and believe me that if your father had only been willing, our alliance would have been signed sooner. I offered to collaborate with you many times, you know. What's more, I protected both your father and you on a number of occasions. For example when you were staying at Marandon's house, didn't I tell you over the telephone that I knew where your father was hiding? What better way could I have chosen to warn him to be on his guard?"

The two men shook hands. However, before they could continue their conversation, they heard a terrific racket at the far end of the passageway. Gilbert's two guards were fast bearing down on them . . . The young medical student didn't have a second to lose. Hurriedly he swallowed another pill A and stopped time once more. Then he resumed his methodical inspection of the underground corridors and rooms. He passed by the two guards, who had been frozen in their tracks, and went down another staircase where the air smacked of iodine and seaweed. Toward the bottom of the staircase he noticed that the air was clean and fresh. A few moments later he was standing at the edge of an underground pier where the two powerful launches were riding at anchor in the choppy waters.

"Well I'll be!" Gilbert murmured, "Launches with B- and V-type engines! I'll bet these engines have at least three thousand horsepower."

Then, without bothering with the immobile men who were scattered on the pier and boats, he crossed the short gangway, drew a knife from his pocket, and set to work on the motors' ignition wires.

The four-engined transport cut through a clear sky, propelled toward the south by its 6,000-horsepower motors and by a strong northeast wind. Valence and Montélimar passed by. On the Provencal plain below, the cypress trees were bending like riding-whips; the passengers could see the huge canals of Donzères into which the swollen Rhône was pouring tons of water and foam.

In the air the situation was far from restful. The plane frequently fell into air pockets from which it emerged, but only after the passengers had been badly shaken up. The co-pilot took his place at the controls, and both he and the pilot glanced frequently toward the left wing.

The plane left the Rhône above Pont-Saint-Esprit; it passed Mount Ventoux whose summit was crowned with a wreath of unraveled clouds. On the left, dirty grey streaks of smoke mixed with the exhaust from the second motor. The huge transport next cleared the pebble-lined Durance River at a very high altitude.

The wind grew stronger. The two pilots leaned over the dashboard where a quivering needle was moving toward a red line. The stewardess said a few words to them, then returned to the passengers with a stereotyped smile on her lips. They had just passed Salon; the railroad tracks of the Paris-Marseilles line cut straight across the desert of Crau toward the salt pond of Berre.

"Is everything all right?" asked Noroy.

"Everything is fine," answered the stewardess in a reassuring voice.

She had scarcely spoken when there was a blinding

red flash and the second motor on the left caught fire. "Attention everyone! Fasten your belts!"

The electric signs on the safety apparatus lit up. The frightened passengers on the left side of the plane were thrown to the right. Then the transport went out of control and dived toward the ground, leaving a black trail of smoke in the sky.

"This could be the beginning of the end," murmured Noroy.

At this very moment the passengers heard a violent hissing, and the flames disappeared amid a white vapor: the fire extinguishers had just done a very thorough job. But the *Languedoc* was plainly in no condition to finish its route. The ground was rapidly approaching, the flat and dry ground of the Crau desert, strewn with pebbles and stones. The pilots prepared to make a crash landing. The co-pilot appeared in the doorway of the cabin:

"Keep cool and hang on tight! We're landing!"

The enormous plane now plowed into the wind and was soon zigzagging near the ground at the mercy of every passing gust. Finally it hit the ground, bounced back into the air, then hit the ground again, rolled a few hundred feet, spun wildly around, and stopped short. Only then did the passengers notice that smoke was pouring from two of the plane's other engines.

"s.o.s. / . . . / — — — / . . . / s.o.s." hummed the wireless, while the radio operator picked up a microphone and radioed the position of the wreck to the Margnane airport.

The passengers climbed quickly out of the crippled plane and looked silently around them. It didn't take them long to discover that they were in the middle of nowhere. There wasn't a road or a house in sight. Nor was there a sign of life, except for a few cypress trees which were swaying in the wind at the foot of a low mountain range.

As soon as the passengers had recovered from the shock they began to chatter noisily. Some thanked their lucky stars that they were still alive; others grumbled while pacing up and down the pebbly terrain and looking at their watches. A few men and women formed a circle around the stewardess who had fainted when the plane hit the ground.

Noroy walked over to the two pilots.

"Sabotage?" he asked.

"Very likely," said the first pilot. "Three motors don't catch fire at the same time . . ."

"I'm in a terrific hurry," Noroy rejoined. "Do you know whether General Rayssac is going to send us a rescue plane?"

"He's sending jeeps," replied the pilot. "A plane couldn't land here and a helicopter would be overturned by the wind."

"And there's no road," Noroy said nervously, "no car . . . We can't do a thing!"

"No," answered the pilot, "not a thing . . . unless . . ."

He pointed to the railroad tracks whose telegraph wires were singing in the wind like a harp. A low rumbling could be heard in the distance.

" . . . unless we can stop the train," said the co-pilot.

"That's impossible," Noroy replied with a smile.

It was not long before the locomotive appeared on the horizon, nearly enveloped by the smoke and soot pouring from its funnel. The train, which was tearing along at more than sixty miles an hour, grew larger from second to second. A shrill whistling sound rent the air at the moment when Noroy swallowed a half capsule of H.S.M. This reduced dose seemed just right to him, seeing that he had to make few movements to accomplish his purpose. The world around

him was instantly cloaked in silence. The train, a fast southeast express with sleeping-cars, a dining car, and a super-Pacific locomotive, appeared to stop dead in its tracks. Noroy ran his fingers over the locomotive's motionless connecting-rods and gazed with amusement at its smoke which hovered immobile in the air. Next he walked in front of the huge locomotive and playfully gave it a light shove. Suddenly he felt a chill go down his spine and his blood freeze in his veins. To his horror he noticed that the train was not as immobile as he had thought and was creeping up on him inch by inch. Quickly he jumped off the tracks to avoid being crushed. Only then did he see that the smoke from the locomotive's funnel was spiraling ever so slowly toward the sky.

"Whew!" the scientist exclaimed, "that will teach me to swallow only a half pill of H.S.M."

Noroy ran nimbly along the train, seized a hand-rail, and hoisted himself on to the steps of one of the cars. He opened the door, slipped into the corridor which was teeming with petrified people, dropped his grip on an empty seat, and downed a pill B...

An instant later the train appeared to start off once more at a terrific speed and the people, who had been stranded by the plane wreck, were astonished to see their fellow traveler, Claude Noroy, shouting to them, "So long, so long," while waving his handkerchief furiously out of the train window.

ON ENTERING the lobby of the Hotel Regresco, Noroy wondered anxiously whether his son would keep his appointment.

Troubled by his thoughts, the scientist walked around the tables and chairs and gazed at the people who were busy chatting, reading newspapers, or writing letters. His son was nowhere to be seen, and the clock over the revolving door pointed to 10:10 a. m. Becoming more worried with each passing minute, Noroy sank into an armchair, picked up a newspaper from a nearby table, and tried to read. He had not been reading long when he heard a familiar sound which set him at ease—a brief but piercing whistling sound which was almost immediately drowned out by a muffled rumbling. The revolving door was whirling at such a speed that it was no longer possible to distinguish the individual glass panels. To the startled onlookers it seemed as though the inside of the door were filled with a misty mass which sparkled in spots and which rumbled menacingly. All jumped to their feet and stared at the terrifying phenomenon—that is everyone except Noroy, who had seen a small rectangular card fall on his lap. It was a calling card from his son which bore a message containing three lines:

"This time my absence will not go by unnoticed. The alarm may be sounded at any minute at Castelroc. Nevertheless we can meet on the quay."

"That's an excellent idea," murmured Noroy lifting a pastille to his lips.

The door immediately stopped whirling for him and for him alone, and he strolled out of the building, leaving behind him in the lobby the immobile and stupefied crowd of vacationists. On the sunny quay he saw only one person moving: Gilbert. The young man rushed toward him with outstretched hands, but Noroy waved to him to stand back.

"Let's not get sentimental, son. If we shook hands too hard, we might bruise ourselves badly. But tell me, how do things stand?"

"Everything's fine enough, but let's not stay here. This spectacle prevents me from thinking and speaking freely."

And the youth resolutely turned his back on the silent port, on the frozen sea from which the legs of a diver, who had not completed his plunge, jutted out stiffly into the air, and on a nearby fisherman who had just made a catch which was floating motionless in space.

Father and son swallowed B capsules only after arriving in the heart of a pine forest situated far from the city, where no one could spy on their movements.

"Any minute now my captors may discover that I escaped from Castelroc," said Gilbert. "Everything depends on Rides, who promised to conceal my flight."

"What's that you say?" exclaimed Noroy, "Rides is protecting you now?..."

"Let me speak, dad. My first conversation with Rides and Walker wasn't at all disagreeable. Rides in particular seemed well disposed toward me. When I spoke to him again later on, he appeared ready and willing to call off our quarrel and team up with us."

"He's already played that game."

"Perhaps, but this time I think we can trust him. His interest compels him to stick with us."

And Gilbert told his father the story of his kidnapping and of his trip to the south.

"I met Rides and Walker here," he added. "Neither the American nor the Englishman showed me any ill-will. Furthermore it seemed to me that they didn't enjoy much more liberty than I did. Falkenberg arrived at Castelroc at the moment when Rides was speaking to me cordially, and he reproached him for this, bitterly, in my presence. We were in the office of the director of the sanitarium who is, believe it or not, Altkim (though he goes by the name of Gontcharow) and whom I had never seen before. Falkenberg made me leave immediately and the argument continued.

"If Rides is now convinced that the means which you have used to fight against him are rather extraordinary, he is also certain that Falkenberg will distrust him from now on. He knows that in order to save his skin he must switch alliances.

"When the German asked me to leave the director's office, I decided then and there to return. By using H.S.M. I slipped back a few seconds later without the slightest difficulty. Falkenberg was alone and was poring over a thick memorandum book. I leaned over his shoulder, but the pages were covered with figures which were meaningless to me. In order not to waste time I quickly left the office and set out looking for Rides and Walker. While roaming about the corridors I came across a few dozen men who were carrying heavy bundles. Glancing around me, I saw that the doors of all the rooms were wide open and that the rooms themselves were in complete disorder. I knew then that Falkenberg's gang was preparing to clear out of Castelroc. But how? A rapid exploration of the premises made it clear that there were no cars waiting for them either on the terrace or in the yard or outside the gates and walls. How then were they going to make off with their ill-gotten documents? I retraced my steps and came upon the petrified men whom I had encountered a few moments before. I noticed that some of them had been making for the cellar before H.S.M. had stopped them dead in their tracks. Curious to see what they were planning to do down there, I descended several brilliantly lighted and seemingly endless staircases and finally arrived at a wide arcade which led me to the foot of the cliff and the seashore. To my astonishment I saw two powerful launches berthed at a quay which had been constructed in a nearby grotto. In a few minutes

the two launches would carry Falkenberg, his accomplices, and the precious documents far out to sea. What could I do to hold them up? I thought first of overpowering and tying up the crew. Though I was only one against many I could have put them all out of commission without any trouble. Thanks to H.S.M. not one of the sailors could have even lifted a finger against me. But then on second thought I decided to cripple the ship's motors and electrical equipment. I did this in short order and then went up again to Castelroc in order to continue my investigation.

"I explored all the rooms of the sanitarium and found Esprels peacefully sleeping in one of them. Your old friend was not alone. Jean Thévenet was at his bedside and was trying to seize stealthily a portfolio which was partially hidden under the old man's pillow. His fingers touched the embossed leather. H.S.M. prevented me from seeing him actually take the portfolio, but I could easily imagine how he would do it. Watching him, my blood began to boil. I was indignant and ashamed that Jean would steal to get what he wanted. Angrily I rapped him on the face and left the room. I'll bet he thought someone had hit him with a sledgehammer.

"Next I wanted to find out whether I could see the launches from the terrace. I surveyed the cove carefully, but there wasn't a ship in sight. As I turned to leave I saw Rides leaning over the railing; doubtless he was looking for the same thing I was. Thinking that no one was watching him, he scanned the scene placidly. His face showed neither care nor fear. How, I wanted to know, had his conversation with Falkenberg ended? A pill B of H.S.M. permitted me to find out immediately. Seeing me rise up suddenly in front of him, he lost his composure and jumped with surprise.

"Tell me, are you as resourceful and clear-headed as your father?" he asked excitedly. "If you are, you're going to help me, and we'll get out of here alive."

"How can I help you? What are you afraid of? Who's out to kill you? Why are you so jittery?"

"Rides didn't answer any of my questions. He gazed at me fixedly and said simply: 'Falkenberg won't let Esprels go. The old man has a tremendous amount of knowledge and can be useful to him. You may be sure that he has reserved a place for Esprels in one of the launches down there in the grotto of the cove. You may also be sure that Lina will be obliged to follow her father.'

"Clearly, Rides knew everything! I was so disconcerted that I could only make a stupid reply. 'I shall protect her.'

"How easy that would be for you, if you had an ally!"

"To gain my confidence Rides informed me that Falkenberg had accused Walker and himself of betraying the common cause. Walker had been locked up in a cell on the top floor for having protested too violently that the German was taking the lion's share of the spoils. For his part, Rides had cleverly pacified Falkenberg and as a result had not been imprisoned. But he knew that Falkenberg would never allow him to leave Castelroc alive. He was certain that the German's gang would not take him aboard the launches which were preparing to shove off for Italy, but would lock him up in one of the padded cells

of Castelroc a few seconds before the building was blown up like the laboratories of Aigopal. Falkenberg planned to dynamite the sanitarium in order to get rid of all his enemies at one blow. If his diabolical plan succeeded, Rides, Jean Thévenet, the Aigopal chemists, and Altkim's men, who had been overpowered and imprisoned, would be wiped off the face of the earth. Then he, Falkenberg, could make off



with the documents his three allies had helped him acquire. Worst of all, Rides concluded, no one, with the exception of Altkim, alias Gontcharow, who had mysteriously disappeared, could prevent him from carrying

out his plans. Altkim's sudden and unexpected return could very well upset the German's apple cart and save his captives.

"I asked Rides to explain Falkenberg's attitude to me. He told me that the German doubtless thought that there was no longer any hope of his laying hold of Marandon's discovery. Nevertheless, the information which he had collected concerning the military and economic status of France and other nations was not to be sneezed at. To keep all the booty for himself he had thrown off the mask and accused his associates of having betrayed him. Naturally his accusations were without basis. But they served his purpose well. After that he was the indisputable master at Castelroc.

"Rides was bitter and angry. He knew that the game was lost for him. Therefore he wanted nothing more than to save his life and to wreck Falkenberg's plans—even at the risk of being subsequently indicted by the French Government.

"I was very moved by his story and agreed to help him, on the condition that he would consider himself my prisoner and would promise to surrender to the police if I were prevented from handing him over personally. He agreed almost immediately. Then I told him that I could leave Castelroc whenever I pleased. My statement didn't surprise him at all.

"Haven't you already slipped out once?" he asked with a knowing smile.

"I pretended that I didn't understand his question. 'Tomorrow I shall leave Castelroc a little before 10 a. m. Your fate is now bound up with mine. If no one becomes aware of my absence I shall probably be able to get you quickly out of this hornet's nest.'

"Count on me," he said with a mock enthusiasm which astonished me. 'But tomorrow Falkenberg will be far away and Castelroc will be in ruins.'

"I have good reasons to believe that your former pal will not be able to use his launches for twenty-four hours at the very least."

"That gives us a chance then," he murmured, becoming suddenly more sedate. 'If it's all right with you, I'll come to your room five minutes before you leave and stay there until you return.'

"I left him then and went to sleep. At the appointed hour he knocked on my door.

"Falkenberg hasn't left," he said. 'His men moved all his things out of here and then discovered that the launches were unable to put out to sea. They're repairing them now. I think that they will shove off at eleven tonight. That doesn't give you much time.'

"I can steal from time as many minutes as I need," I answered in order to disconcert him.

"I suspected as much," he replied simply.

"His remark came as such a shock that I remained

speechless for a few seconds. Then, when I had regained my presence of mind, I told him to lock himself up in my room and to make a lot of noise so that our enemies would not become aware that I had gone.

"I shall return before eleven o'clock tonight," I said. "Now please look out the window and see if the terrace is deserted."

"He turned his back on me and leaned out. Quickly I swallowed a pill A of H.S.M. and rushed to meet you at Cassis."

"BUT HOW did you get out of Castelroc this time?" Noroy asked his son after having listened with the greatest attention.

"I'll tell you later—after you've told me how you intend to put our enemies out of commission for good. If I revealed to you now the manner in which I escaped, perhaps you wouldn't believe me."

Noroy began to speak in his turn.

"We are going to make a fast reconnaissance; then, this evening, as soon as it's dark, a hundred men, drugged with H.S.M., will attack Castelroc. We shall be at their head."

"Wonderful!" shouted Gilbert.

"Hold on! If we win, we will still have a very disagreeable job to do. Immediately after arriving at Marseilles I called the *Dodecagon* and inquired about Marandon's condition. I'm glad to say that he's a lot better. I think that he's been informed of what's going on. What's more, I think he wanted to speak to me and was silenced by our good friend Varik. What a pity! Marandon could have perhaps made us understand his nephew's attitude. In any case we shall have to deal severely with your friend Jean. Thévenet followed his uncle's work with interest for a long time and was in a position to hand his secrets over to the party who could pay the right price. Doubtless Falkenberg's offer was so attractive that the poor boy lost all control of himself."

"He will pay for his weakness dearly."

"That's what hurts me—and you too, I suppose."

Gilbert Noroy lowered his head. Yes, he felt indeed very sad, because he liked Jean Thévenet very much.

"It was devilishly clever of Falkenberg and his pals to pretend that Castelroc was a psychiatric institution," murmured Noroy. "What better way could they have found to keep the police from the door. If need be, they could explain the strange behavior of those who were being held there against their will."

"This explanation answers one of the questions which have been puzzling me," said Gilbert. "The next thing I'd like to know is why they always attacked your friends and never you directly."

"You forget that they attacked me at home more than once," replied the professor. "It is true, however, that my enemies treated me discreetly on the whole. Why they never went so far as to kidnap me is a question which doubtless Samuel Rides could answer. I assure you that if they had tried to kidnap me I would have offered them no resistance. But it's just as well that things happened as they did. You've handled the situation very well, son. Now listen to me carefully. When you return to Castelroc you will show yourself only in the event that no one, outside of Rides, has become aware of your absence. I am going to take a room at the Regresco and will leave around nine o'clock. At nine-thirty we will attack Castelroc by land and sea. Let's go now and inspect the terrain and the coast."

At exactly nine-thirty that night a bell rang in the rooms, the attics, the gardens, the cellar, and on the

terrace of Castelroc—a bell warning Falkenberg and his gang that danger was close at hand.

"Altkim has caught on to my game," the German muttered. "I should have left here as soon as he disappeared. Now he's back for his share of the spoils, and doubtless with plenty of men to back him up."

Falkenberg immediately gave the order to evacuate the premises. His launches, which had been mysteriously sabotaged the evening before, had been repaired. All the documents, which he planned to carry away, were in his cabin. He had no reason to stay on French soil any longer. He stood only to gain by advancing the hour of his departure and by blowing up Castelroc a little earlier. Altkim and his meddling pals would pay dearly for forcing him to leave in such a hurry: they would be blown up along with all his prisoners!

As Falkenberg turned to leave his room, one of his men rushed in to tell him that the safes in the launches had been emptied and their contents taken back into the building. All his precious documents and records were once more in the laboratories and offices of Castelroc! Worse, the explosives which had been placed under the foundations of the sanitarium, had been removed and dumped in the holds of the launches!

"I don't have the time to settle accounts today," Falkenberg growled, "but the rats who did this job will pay with their lives before long. Tell all our men to fall back into the building and then lock all the doors. Our detectors indicate that some sixty men are surrounding the place. We're under attack. The devil alone knows who betrayed us! . . . Well, what are you waiting for? Get a move on! We're going to give them hell!"

His orders were immediately carried out. Satisfied with himself, Falkenberg walked over to a window in order to keep a sharp eye on the entrance gate which was brilliantly lighted by a powerful lamp while the building itself was plunged in total darkness.

A moment later he witnessed a terrifying spectacle.

He saw the thick bars of the gates disappear one by one and he had a feeling that the gates themselves would soon vanish. Without taking the time to discover the cause of this frightening phenomenon, he ordered his men to retreat to the cellar. When the last of them had gone down the long winding staircase, he locked the enormous metal door which resembled that of a strong-room and which guarded the entrance to the cellar. His pursuers, he thought, would never be able to break down this mighty steel barrier as easily as they had the garden gates.

Naturally he had to leave all his booty behind. But he swore to himself that his satanic enemies would never make use of it, for he would destroy it first with the explosives lying at the bottom of his ships. But how much time would he have before his pursuers succeeded in smashing through the protecting steel door? What supernatural means had they used to destroy the massive garden gates? . . .

The first thing he did on reaching the quay in the grotto was to have the explosives taken off the ships and placed in the long arcade which led from the staircase to the seashore. He realized that a blast in the arcade would not destroy all of Castelroc, but he was sure that it would level a considerable portion of the building and wipe out a good number of his enemies.

As soon as the dynamite had been removed from the first launch, Falkenberg climbed aboard with half his crew, and the powerful boat moved slowly away from the quay, its stem turned toward the sea. The

crew of the second launch had not yet finished taking the cases of dynamite ashore. To tell the truth, Falkenberg's men didn't realize what was going on and were working rather sluggishly. Furious, the German opened his mouth to egg them on with a few well-chosen curses, but his first words stuck in his throat.

Before his startled eyes some fifty men suddenly



"... at the very moment when they had fired ... some fifty men had dropped out of nowhere and disarmed them."

dropped out of thin air and aimed their guns at the sailors who were still on shore. As it was, however, their guns proved unnecessary. At the mere sight of the invaders, Falkenberg's men, crazed with fear, threw themselves to the ground and lay there motionless.

"Good God!" the German exclaimed. "Have I gone mad?"

At that very moment a flash of lightning lit up the sky and the sea. Seeing it, the superstitious Falkenberg lost his head completely. Were the heavens themselves against him? Under any other circumstances he would have rushed to the aid of his fallen comrades. On this night, however, he was desperate and panicky and thought only of saving himself.

"Full steam ahead!" he bellowed.

And the launch moved off into the inky night. The invaders on the shore, whose numbers had suddenly been doubled, allowed it to leave without firing a shot. For a few moments they watched its white wake disappear in the darkness. Then they turned their attention to their immobile prisoners.

FALKENBERG's launch had not covered a mile before it was picked up by the beam of a powerful searchlight.

"Clear the deck for action!" shouted the German, who was ready for anything.

A new flash of lightning split the sky and allowed him to spot the source of the light which was blinding him. It came from a nearby launch which seemed to him far more powerful than his own. As the launch came closer and closer, a furious voice drowned out the sound of the waves and the wind:

"Ahoy, Falkenberg! We're coming aboard. If you resist, your life isn't worth a hoot." A clap of thunder punctuated this threat.

"It's Altkim and his gang," the German cried to his men. "Hold your fire! Slow down and let them close in. But as soon as they've climbed aboard, give

them no quarter: if they win, they will show us no mercy."

Altkim's boat slowly approached Falkenberg's. Soon the two launches were sailing side by side.

"Fire!" the German suddenly shouted, seeing that Altkim's crew had trained their guns on him and his men.

"Fire!" the Russian screamed at the same second.

But the bullets of the two enemy crews shot toward the thick clouds which hid the stars, for, at the very moment when they had fired, a violent jolt had shaken each boat and some fifty men had dropped out of nowhere and disarmed them. Evidently they could not have hidden in the launches. And yet there they were—fifty strong, and the indisputable masters of the situation. Falkenberg's and Altkim's terror-stricken henchmen thought that their assailants had suddenly risen out of the sea.

It wasn't long before Falkenberg recognized one of these extraordinary pirates.

"You, Gilbert Noroy!" he shouted while clutching the railing in order to maintain his balance which was now jeopardized as much by his emotions as by the swell of the sea. A series of lightning flashes lit up the launches and he saw that he wasn't wrong. It was indeed Gilbert Noroy! He also saw that the invaders were putting handcuffs on his companions and that a stranger was at the helm of his boat. He, Falkenberg, was no longer the skipper!

"How did you win?" he groaned, sensing that he was fast going out of his mind. "What kind of weapons did you use?"

"This simple pastille," said Noroy's son placing a thin gelatine capsule before his eyes.

What went on in Falkenberg's mind? Seeing himself lost, did he think of taking his life or did he think that he had found a means of escape? Did he have a sudden revelation of the fantastic power of the pastille? The fact remains that before Gilbert could stop him he grabbed the pill, swallowed it, and immediately disappeared under the very eyes of the occupants of the two launches.

Gilbert gasped. Was he going to allow his father's most formidable enemy to recover his liberty? After a moment's hesitation he downed a pill A in his turn. Then, seeing that the launch was no longer pitching and rolling, he jumped overboard, certain that he could walk safely on the waters.

A bolt of lightning rent the sky and remained there nearly immobile, its forks outstretched like the tentacles of an octopus. In this light the motionless and immense sea, with its deep valleys and mountainous waves, looked very much like a stage setting. In the distance a sailboat with triangular sails remained fixed in its place. A flock of nearby seagulls hovered motionless in the air, their wings outstretched, their mouths wide open. Gilbert cocked his ears in vain—no sound came from their petrified throats.

Gilbert scrambled up the crest of a wave which, to him at his speed, appeared to be as hard as glass, clutched the solidified foam, and scanned the sea for his escaping enemy. A few moments later he saw Falkenberg racing across the waters toward the coast. "Falkenberg! . . . Falkenberg!" he shouted.

The German was running, keeping clear of the sharp-edged waves. Hearing Gilbert's call, he picked up speed. He knew very well that a bullet couldn't reach him.

"Commander Falkenberg!"

Falkenberg stopped an instant. Standing on the intersection of two waves, which formed a pedestal for him, he raised his arm in a gesture of bravado. At the same moment something moved on the terrifying stone landscape! The bolt of lightning, setting the air ablaze, veered toward Falkenberg, seeking this nearest channel to "ground." Realizing that his life was in danger, the German ran from right to left, but foolishly stayed erect. The fiery serpent had him as its prey. Falkenberg's entire body became phosphorescent and lay lifeless on the side of an immobile wave which was ready to break into foam.

Sealing wave after wave, Gilbert slowly returned to the launch. When he had taken his place once more at the side of the helmsman he swallowed a capsule B of H.S.M. which immediately returned him to the normal rhythm of life.

"Head for Castelnoc," he said. "We shall never see Falkenberg alive again."

BACK in Altkim's office, Noroy and his son explained to Lina and Esprels the different phases of the attack of Castelnoc.

"We had decided to surround the place at once by land and sea," the professor said. "Thanks to Favre-Perronet, I had a hundred very select policemen at my disposal, all of whom were resolute and courageous. They knew what I expected from them; they were acquainted with the properties of H.S.M. and each one of them had three or four pastilles at his command, according to his needs. Gilbert had told them that these capsules would multiply their mental and physical powers enormously and even permit them to walk safely on the waves. After downing a pill A of H.S.M., he had informed them, they would move at so tremendous a speed that they could tread on the waters of the sea as easily as though they were walking on solid ground.

"It was indeed by sea that my son had escaped from Castelnoc the second time. He had gone down the staircase which led to the cellar and the arcade and then proceeded to the quay in the cove. But it had been impossible for him to throw himself into the water inasmuch as it offered the same resistance as *terra firma*. You will soon see how we turned his discovery to our advantage.

"To make a long story short, our men were burning to try out my accelerator.

"As we had expected, the gate of Castelnoc gave them no trouble at all. They broke it down in nothing flat. On the other hand, the armored door, which guarded the entrance to the cellar stopped them for a moment. Nevertheless we arrived on the quay in time to capture the crew of Falkenberg's second launch with no difficulty.

"For the first time, a large number of men were using my compound simultaneously. In order to facilitate their task I had given them two types of H.S.M. and one squad was moving much more rapidly than the other. Consequently it is not surprising that the second squad, which had swallowed the more potent capsules, captured Falkenberg's sailors before the

first squad had even appeared on the quay.

"Gilbert might have been able to sow confusion in the enemy's ranks and ease our victory. Unfortunately the exertion involved in returning the stolen documents to the



labs and offices of Castelnoc and in carrying the explosives from the building's cellar to the holds of the launches had exhausted him. He was able to help us again only a few moments before our men set out in hot pursuit of Falkenberg's boat. As soon as Gilbert had regained his strength I put him in command of the squad which was preparing to attack Castelnoc by sea.

"Now you know why I allowed Falkenberg to escape aboard his launch. I knew that in a moment or two my son and his men would put out to sea and would capture him without the slightest hitch. I need not go on with my story. What you know about hexystro-molybdenum is sufficient to give you a clear idea of how Falkenberg was captured, how he tried to escape, and how he ran to his doom.

"As luck would have it, Altkim, who had got wind of Falkenberg's intentions, sailed out to intercept him and fell right into our hands. So that with Rides and Walker, whom we 'liberated,' we now have in our power all those who opposed the realization of our plans. Furthermore we have freed all our friends."

"You have forgotten Jean Thévenet," said Esprels.

"It is true that he joined forces with our enemies."

"In that case we would have found him aboard one of the launches," retorted Gilbert. "As it is, we don't know what has become of him."

"Are you angry at him for some reason, Esprels?"

"Certainly. You know how I dislike taking your H.S.M., don't you? Well it so happens that he made me swallow some against my will. Then, after downing a capsule himself, he forced me to follow him and handed me over to the men who took me here."

"It's just as well that he didn't fall into our hands," said Noroy. "I found among the notebooks and papers which Gilbert recovered, duplicates of Marandon's documents. My blood boils at the thought that I risked my life to safeguard the originals of these documents in the belief that there were no other copies in existence. Thévenet is an abominable traitor."

"Sir Samuel Rides can compel you to pardon him," murmured Lina.

Esprels gave a start. "Really, Lina?" he asked.

"Yes, father," the girl answered.

"Gilbert, tell our guards, to bring Rides here," ordered Noroy.

"What for?" said Esprels. "That scoundrel has already tricked us too many times."

But Gilbert had already left the room.

A few moments later, Rides stood before Noroy.

"Do you know what has become of Marandon's nephew?" asked the professor.

"Certainly," said the Englishman. "They locked him up in one of the padded cells of this place."

"Why didn't you say anything till now?"

"Let us say that the understandable desire to stay alive forced me to keep my mouth shut. You haven't captured all your enemies, you know. But if you protect me, I shall take you to Thévenet's cell."

"If he's in one of the underground cells which I've heard about," said Esprels, "we have little chance of finding him alive. A man can't hold out there for more than eight hours."

"And Thévenet," affirmed Rides, "has been there for more than twenty-four hours."

"All of which would seem to prove that he didn't betray us," Lina observed.

"Or that he double-crossed his new friends," said Esprels.

"Rides, take us to the cell," ordered Noroy.

"Allow me not to accompany you," said Esprels.

"I feel exhausted. Take courage, Noroy . . ."

"Poor Marandon," murmured the professor after dismissing Esprels with a nod. "How can I tell him the bad news? Go, Gilbert. Take some of our men and follow Rides. Come back as quickly as possible and tell me what has happened to Jean Thévenet."

"Take him to the infirmary," he ordered after hearing of the captive's distressing condition. "I want him to get the care that he deserves."

ONE hour after Jean Thévenet had been taken from his cell to the infirmary of Castelroc, Professor Noroy called Gilbert and Lina into Altkim's office.

"The traitor has at last been punished," the scientist said. "Let's talk about you two now."

"Are you sure that you haven't made a mistake?" asked Lina in a trembling voice.

"Certainly not, my dear; my ex-friend Esprels will pay dearly for his duplicity. Where he's going, he'll have plenty of time to regret what he's done."

"What's that you say?" shouted Gilbert, who was as disconcerted by the professor's remark as by Lina's incomprehensible calm.

"I say Esprels betrayed us and we suspected Jean Thévenet unjustly."

"Aren't you going to defend your father, Lina?"

"No, Gilbert. Esprels is not my father."

"Calm down, son," said Noroy. "Marandon has now recovered his health. Varik told me so a few minutes ago over the telephone. The good doctor boasted about the effectiveness of his urea capsules and saltless diet, but naturally didn't say a word about the effectiveness of H.S.M. After talking to Varik, I was connected with Marandon and told him all that happened. He listened with the liveliest interest to the story of our adventures. When I had finished, he confessed to me that he, like his nephew, had always distrusted us, but that he had feared Esprels even more than me."

Lina was formerly Marandon's secretary. Two years ago Marandon sent her on a mission to Switzerland. She was instructed to get a job in Esprels' laboratories and find out what kind of experiments he was carrying on at Lausanne. Lina played her rôle well. She gained Esprels' confidence to such a point that the old Swiss could no longer do without her and in-

troduced her to me as his daughter when he offered to collaborate with me.

"Thanks to Lina, Marandon always knew what Esprels was up to. Indeed if a stroke had not disabled our old friend, this traitor who was in Falkenberg's pay would have been unmasked much sooner."

"Unfortunately for us, neither Marandon nor his young collaborator ever found out that Esprels was not a lone operator. They never discovered that Falkenberg was behind him. Had either of them known this, our task might have been much easier."

"When Marandon was stricken, Lina thought that she was lost. She didn't dare confide what she knew to anyone. She decided to hide her time and to strike when the iron was hot, as she did a little while ago. While waiting for the right moment to act, she kept her eyes and ears wide open so that she might turn to advantage anything that she heard or saw."

"Of course her kidnapping was a put-up job. Feeling that things were getting too hot for him, Esprels had her taken to Castelroc and prepared to flee there himself."

"On the other hand, Jean Thévenet was the victim of a real kidnapping. Esprels had rapidly become aware that our young friend knew everything about his uncle's work and that he had in his possession documents of the greatest importance. The Swiss knew more about my H.S.M. than I ever suspected. He stole Thévenet's supply of pastilles and then, in a surprise move, forced him to swallow one. You can imagine the poor boy's fright when he discovered that all his capsules were gone and that he was unable to return to his normal state for twenty four hours. He had no choice but to follow Esprels who had swallowed an A pill in his turn. It was all Thévenet could do to hide his notebook from Esprels and leave it behind so that we might have an inkling of what had happened. Unfortunately we misconstrued what he had written and could not interpret the sentence which he had not been able to finish."

"Though a prisoner, Thévenet didn't consider himself licked. Taking advantage of the relative liberty which he enjoyed at Castelroc he tried to regain possession of his H.S.M. Just then you entered the room, Gilbert, and caught him at Esprels' bedside. The blow which you gave him wrecked his plans. Esprels woke up, called for help, and Thévenet was locked up in the underground cell where we found him. Luckily he had managed to grab a capsule of negative H.S.M. and swallow it before being dragged away from Esprels' bedside; so that his captivity seemed to him to last for no more than a few minutes. He's all right now and will confirm everything."

"Esprels told his accomplices nothing about the remarkable properties of H.S.M. It was his intention to use my compound, in case of emergency, to escape from us or them."

"Shall I describe to you General Favre-Perronnet's astonishment when he learned the other evening that he was carrying on his person in the lining of his wallet microfilm copies of Marandon's precious documents? This trick put him in such a good mood that he promptly gave serious consideration to the proposals which President Blonderville had made to him in my behalf. I got from him all the information and help that we needed. Looking over his files, I discovered that I had not been wrong: the only criminal whom we had to deal with was Falkenberg. For their part, Rides, Walker, and even Altkim wanted nothing more than to come to an understanding with us, I also learned that our intelligence service had done a good job. By dint of much

hard work, our intelligence officers had become acquainted with all of Falkenberg's activities. The only things they still had to discover were from what source he got his information, where he was hiding out, and where he had imprisoned his captives.

"Thanks to Gilbert, we were able to give them the information they needed. With our help and the complete co-operation of the regional authorities, they immediately closed in on Castelnor.

"We can now say that we have won victory."

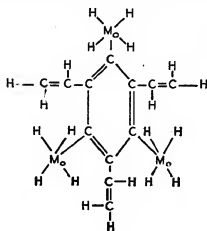
While the professor was speaking, his son stared intensely at Lina. Realizing what was going on in the young man's mind, Lina began to smile. Noroy gazed at the two of them and his face lit up.

"I suppose that you want to set the date of your marriage," he said. "I'll leave you alone now . . . You can tell me when . . ."

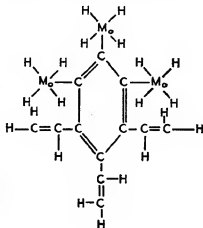
He stopped speaking. Gilbert and Lina had disappeared. The two lovers had just swallowed capsules of H.S.M. in order to hide their joy and confusion and to steal from time a few precious minutes during which, unobserved by a silent and immobile world, they could draw up their plans for the future.

THE public was astounded at the news of Marandon's invention, the famous "water petroleum," which threatened to ruin an important world industry. First, there was panic on the world's stock markets, revolutions in Iran and Venezuela, and partial mobilization in America. Then Marandon made his famous statement concerning "pilot molecules" in which he stressed the fact that in order to transform water into fuel, appreciable quantities of natural petroleum had to be used. Finally the world's markets were stabilized and the golden age of the automobile began—an age in which fuel (in spite of taxes) represents only an insignificant part of the cost per mile.

It is well known that the United Nations took both Marandon's and Noroy's inventions in hand and that this powerful organization is strong enough to impose its will. "Water petroleum," H.S.M.-A, and H.S.M.-B are under its strict control. That is why we take the liberty of publishing below a document which has been classified till now as ultra-confidential: the double "developed formula" of H.S.M.-A. and -B. We feel certain that no one will be able to misuse it. +



HEXO-STYRO-MOLYBDENUM A
Accelerator
 $C^0 (MoH^1)^2 (CH-CH^2)^2$



HEXO-STYRO-MOLYBDENUM B
Decelerator
 $C^0 (MoH^1)^3 (CH-CH^2)^2$

Postscript

DEAR READER, permit us to repeat Montaigne: "This is an honest book." You have just read the adventures of Marandon and Noroy. You have applauded the dreadful punishment of Falkenberg, who was a victim of the avenging H.S.M. . . . What is "possible" in this story of "stolen minutes"? Where do the liberties which Henry-Gérard Viot and I have taken with science stop?

This frank confession is rather rare among the authors of science fiction. You will look for it in vain in the works of Jules Verne, who would like us to believe that "everything is true," or in the works of the English novelist Wells, who leaves it up to his reader to discover the line of demarcation between tragic fiction, humor, and reality.

We are going to be more modest here. Apart from what you have just read in these last pages, there is no real instance of immobilized time in the annals of contemporary science. There is no instrument which can either lengthen or shorten time. This fact, of course, didn't stop us from inventing one. Had we not done so, there would have been no novel!

Contrary to what we have said, hexo-styro-molybdenum is not a derivative of adrenaline which, to be sure, is a stimulant of physiological functions, but which would have proved incapable of bringing about an acceleration of time affecting several million people. As the formula, which we have developed and published here, shows, it is an organic product of substitution in which the styrene radical and the molybdenum metal occupy the six vertices of a benzene carbide. One can see at a glance the double connections which, being easily broken by salivary reaction, assure an instantaneous diffusion of the product of the nearest nerve endings. This rapidity should not surprise you. A drop of prussic acid H.C.N., placed on the tongue of a strong dog, would kill it in a few seconds. . . . Naturally the drug H.S.M. could not be revealed as being inferior to H.C.N.!

With such a starting point, we developed our story. While writing we encountered difficulties capable of discouraging less

determined authors. Just fancy that the individuals who are under the influence of H.S.M. ought logically to be not only deaf but blind! Here, for example, is how we proceeded in writing the account of Falkenberg's death. The speed of propagation of lightning, according to the most recent Italian documents, is about 50 meters per microsecond, i.e. 50 million meters per second or one-sixth the speed of light. Falkenberg had to be "pursued" at a likely speed, say 20 meters per second (72 kilometers an hour). If you divide 50 million by 20, you get two and a half million.

Such was the acceleration factor of H.S.M. which was imposed in the story for the episode of Falkenberg's death. Under these conditions, the resistance offered by water to a solid body striking it is multiplied by 6,000 billion, that is to say that the water offers the resistance of a sheet of metal. Consequently there was no difficulty in "walking on the waters."

Let us next discuss light, which is propagated at 600 trillion vibrations per second, the average value for the radiations perceived by our eyes. Let us divide by our "H.S.M. factor" of two and a half million: we get 240 million, which corresponds to a wavelength of 1.25 meter. We are no longer in the domain of optics, but in that of radio short waves which are obviously invisible to the human eye.

As for sonorous vibrations, it's still worse. Let us take a sound which corresponds to the middle range of the piano, say 500 vibrations per second: for Falkenberg and his pursuer this corresponds to one vibration in an hour and a half! It is no longer a sound, it is a light breeze blowing at long intervals. . . .

These objections, which may have a scientific basis, were the subject of many heated discussions between Henry-Gérard Viot and myself, but there was assuredly only one answer: "What difference does it make? Let's go on. The essential thing is that the novel be stirring—in short, agreeable to the reader!"

It is for you to say whether we were mistaken.

—H. G. Viot and Pierre Devaux

science news shorts

astronomy

"Ghosts" of Dead Stars

NOT ONLY are there in the heavens many dead stars, such as extinct supernovae, but also "ghosts" of stars as well. That such long-dead supernovae or exploded stars leave luminous ghosts behind is the new theory of the brilliant English scientist, Dr. William H. Ramsey, of the Physics Department of the University of Manchester. Dr. Ramsey points out, among other supernovae, that the Great Crab Nebula (an enormous mass of expanding gas) shows a luminosity 300 times as great as the sun, although it exploded 900 years ago!

Some of these dead or dying star ghosts, such as Tycho, can be detected only by the strong electromagnetic or radio signals they radiate. The remains (ghosts) of such stars are being sought in the most distant regions of the heavens with the aid of the radio-telescope. Ghosts of other dead supernovae are being sought; there may be at least 200 of them, based on the assumption that the radioactive gaseous remains should survive for 30,000 years. It is thought that these ghosts are the remains of thermonuclear explosions (similar to the hydrogen bomb explosion) that occur in galaxies about once in every 500 years.

Dr. Ramsey checked the visible remains of the Crab, by noting the color of the nebular gas by means of a spectro-scope. He estimated that the outside temperature was about 7,000 degrees centigrade and the internal temperature at least 50,000 degrees centigrade. Among remains of other supernovae may be the great loop nebula in Cygnus, and also the radio star in Cassiopeia, these ghosts existing solely in the form of radio signals—the last dying gasps of a stellar hydrogen explosion.—*New York Times*.

Stellar Thermometer

SCIENTISTS have found a way to measure the infinitesimal degree of heat received on the Earth's surface from a distant star, and by using a sensitive photoelectric cell, it is now possible to record the heat in relation to the color of the star. The new photoelectric cell thermometer is also capable of detecting differences in temperatures of only a few hundred degrees, really a very small difference when we consider that a star's temperature may run up into thousands and even tens of thousands of degrees centigrade.

The new photoelectric method of measuring star temperatures was described by Dr. Donald A. MacRae of the Warner and Swasey Observatory, the Case Institute of Technology, at a meeting of the American Astronomical Society in Amherst, Mass. The star's light gathered by a telescope is transferred to a prism, which breaks up the star's light into a spectrum of colors. A piece of metal con-

taining a narrow slit is moved along the color spectrum from red to violet; the sensitive photoelectric cell measures the intensity of the light passing through the slit at the various positions (different colors). In this way the star's heat, by relation to its color, can be accurately measured.—*Science Service*.

Flying Saucers

UNUSUAL COLORED lights in the sky resembling "flying saucers" which cannot be any familiar object, such as a plane or balloon, dirigible, meteor, etc., can certainly and plausibly be explained if a report is received promptly, according to Dr. C. C. Wylie, astronomer of the State University of Iowa.

Dr. Wylie is conducting a special study of meteors that are sufficiently bright to cast shadows. To obtain accurate records of the meteors, reports must be obtained quickly. A typical shadow-casting meteor resembles a ball of fire with a tail (rounded in front and shaped like a pear at the rear). The color of such meteors varies from blue to reddish, with blue-green or green the most common colors.—*Science Service*.

Temperature on Mars

IF A person resided on Mars, he would find the best time for a siesta about an hour and a half past noon. This is the hottest time of the day on Mars, the temperature sometimes rising to 70° F. The mean range of the temperature varies between minus 50° and plus 70° F., according to Frank A. Gifford, Jr., of the U. S. Weather Bureau.

The research by Mr. Gifford was conducted on measurements of the energy radiated by Mars, the energy measurements having first been undertaken by Dr. W. W. Coblentz and the late C. O. Lampland of Lowell Observatory in Arizona in 1924. The presence of a lag in the annual mean temperature of Mars' surface behind the movement of the sun, supplies further evidence that the planet possesses an atmosphere.—*Science Service*.

Moon Is Put to Work

THE MOON of song and story is being employed for practical purposes by scientists. A few of the chores include helping to calculate more accurately the size of the Earth and great distances across oceans and deserts; determining the speed at which the Earth rotates; estimating the size of certain stars, etc.

The moon helps astronomers explore the outer layers of the sun during a total solar eclipse. The mountains of the moon are being mapped by U. S. Naval Observatory scientists at Washington, D. C. It is hoped that the map of the moon's edge will be completed by 1956.

Man may never succeed in erecting a telescope on the moon, but our satellite still can be employed as a telescope, the moon's edge serving as a sort of pinhole camera for certain investigations. This improvised telescope really supplies the

equivalent of an 800-inch telescope, with a focal length of 200,000 miles. The large-scale profile maps being made of the moon are expected to prove extremely valuable in improving our time determinations.

Improved photographic equipment will soon make it possible to photograph the exact position of the moon at any instant against a background of stars. The key to success of the new device is a dense, tilting filter, which eliminates most of the moon's bright light, allowing but 1/1,000 of the light to pass through to the photographic plate.

The result is that the stars surrounding the moon show up clearly on the plate. An "electronic brain" has been assigned the task of plotting an astronomical timetable for the moon, recording its highly erratic motions accurately. Some time this year it is expected that the lunar timetable will be ready; it will show the positions of the moon at half-day intervals until 1971.—*Science Service*.

Dwarf Stars Smaller Than Earth

OBSERVATIONS and measurements through powerful telescopes disclose that some dwarf stars have a diameter about one-third of the Earth's. The smallest white dwarf star so far discovered measures but 2,500 miles across, not much greater than that dimension of the moon. Another dwarf star measures only 3,000 miles in diameter (the size of Mercury, the smallest planet). A number of other dwarf stars are smaller than the Earth (Earth's diameter measures 7,900 miles). Dr. W. J. Luyten of the University of Minnesota has estimated that the diameters of most white dwarf stars are between one-half and four times the diameter of the Earth.

The white dwarf stars are characterized by their high surface temperature and extremely high density. One cubic inch of such a star's material would weigh from 1 to 1,000 tons on Earth, depending upon the density of the particular star. Dr. Luyten reports in the *Astrophysical Journal* that these dwarf stars are, paradoxically, the easiest ones to identify and the hardest to observe.—*Science Service*.

Long Meteor Trails

WHEN meteors enter the Earth's atmosphere they leave behind them ionized air trails up to 30 miles long. Some of these trails have a mean length of 15 to 18 miles. They are measured by two radio-telescopes, located 60 miles apart. Three scientists of Stanford University in California, L. A. Manning, O. G. Villard, Jr., and A. M. Peterson, reported the results of their research to the American Geophysical Union. More than 1,700 meteors were detected in a 5½ hour period, 73 of which produced radio echoes at both radio-telescope stations, one of which was located in Stanford, Calif., and the other at Turlock, Calif. The mean length of the meteor trails was calculated by comparing the echoes from the two stations.—*Science Service*.

The Size of the Universe

AN ERROR in previous calculations in the size of the universe has been found out by Dr. Walter Baade of the Mount Wilson and Palomar Observatories, California. This significant correction is one of the most important discoveries in modern astronomical science. To determine the distance of far-away galaxies, astronomers compare the apparent brightness of two types of variable stars, *cluster-type* and *classical Cepheids*, in the galaxies with the absolute brightness of the same kind of star in our own galaxy. The error resulted from applying a wrong correction for the absorption of the light by dust clouds in space.

When the 200-inch Palomar telescope went into operation, observers found the so-called *classical Cepheids* and determined the distances of the galaxies. They also expected to find the *cluster-type* variables, but could find none. Astronomers then suspected that the galaxies must be much further away than the *Cepheid* calculations had shown. Further evidence from work by astronomers in Australia and South Africa led Dr. Baade to calculate that the error was as much as a factor of two, that is, the galaxies are twice as far away as astronomers have previously thought.

There are other important consequences of the discovery. Since the galaxies are twice as far away, all other objects outside of our galaxy are similarly twice as far apart and twice as large. The 200-inch penetrates twice as far as thought before, a distance of 2 billion light years instead of 1 billion. The age of the universe is also clarified by Dr. Baade's discovery. The newly determined age, 4 billion years instead of 2 billion, coincides with the geological evidence that the Earth's crust solidified that long ago. It was also formerly thought that our galaxy was the largest in the universe—an unlikely estimate that is no longer supportable. —*Minutes of the International Astronomical Union.*

Weather Affected by Sun

WHEN flares or bursts of flaming gas occur on the sun, the Earth's temperature increases, according to recent observations. Dr. Donald H. Menzel, Harvard College Observatory astrophysicist, said that the quality and quantity of solar radiation vary during the sunspot cycle and that these changes in the energy radiated by the sun certainly reach the upper layers of our atmosphere. Variations in the aurora borealis (northern lights) show that the Earth's magnetic field is affected by changes in solar radiation.

Dr. Menzel thinks that further study is necessary, however, before the specific effects of solar radiation fluctuations on the Earth's weather can be determined. Dr. Joseph Kaplan and Hilda Kallman of the University of California at Los Angeles described a new theory at a recent meeting of the American Meteorological Society in New York. According to this theory, increases in ultraviolet radiations from the sun are felt low in the Earth's atmosphere, due to the ultraviolet rays being transformed into absorbable infrared rays. —*Science News Letter.*

Ceramic Fuel

CHEMISTRY in reverse seems to be the order of the day in atomic developments. One would never think of using a ceramic like thorium (in the form of a refractory oxide) as a fuel in an orthodox power plant, but recent researches tend to support the idea that future atomic power plants may employ ceramics as *fuels* and *liquid metals* as cooling agents. This was recently forecast by Dr. L. R. McCreight (of the Knolls Atomic Power Laboratory of Schenectady, N. Y.) before a meeting of the American Chemical Society in Los Angeles, Calif.

The reason for using ceramics is that the atomic reactors to be used for producing industrial power will likely develop such high temperatures that ceramic coatings may be needed on the metal parts to prevent them from melting. In orthodox power-plant and boiler design, ceramics are considered as the direct *opposite* of fuels; they are thought of as metals which have already combined with all of the oxygen they have an affinity for. A nuclear fuel works in the opposite manner from the principle of chemical combination. —*Science Service.*

Neutrons Detect Impurities

A NEW job for the neutrons present in an atomic pile is to detect a millionth (or even a billionth) part of impurity in a metal. Samples of the metal are placed in an atomic pile and the neutrons cause radioactive changes in the material.

These changes are recorded on Geiger counters and other sensitive instruments. Long-lived impurities can sometimes be distinguished from short-lived ones, as the radioactivity of each substance has its own characteristic length of life, and measurements made at different times may thus provide such information. For example, a minute amount of manganese in a sample of irradiated aluminum will continue to emit measurable rays with a half-life of 2.59 hours, after the radiation from the aluminum has ceased.

Drs. G. W. Leddicotte and S. A. Reynolds, of the Analytic Chemistry Division of the Oak Ridge National Laboratory, report that two-thirds of the chemical elements can be determined by this method. —*Science Service.*

Uses for Radiolotopes

INDUSTRY has already found many uses for science's newest tool—the *radioisotope*. These special types of atoms that give off radiation have been put to work in a number of industrial plants for such purposes as measuring the thickness of materials, tracing the location of certain substances, determining wear, etc.

Edwin A. Wiggan, technical assistant to the chief of the isotopes division of the Atomic Energy Commission, recently predicted that many industries would benefit directly or indirectly by the application of radioisotopes within the next five years. One company estimated that radioisotopes had made it possible to complete research on the wear of piston rings (with various lubricants) in four years, at a cost of \$35,000, that would have cost \$1,000,000 and 60 years time using former methods. —*New York Herald Tribune.*

4,600-m.p.h. Atomic Guided Missiles

A GUIDED missile flying at 4,600 miles an hour has a speed equivalent to about 76 miles per minute. At that rate such a rocket or missile could travel from New York City to Philadelphia in 1¼ minutes. Such high-speed radio-directed crewless missiles may be expected soon. At present the U.S. Armed Forces announce a rocket that can speed through the air at 2,700 m.p.h. or about four times the speed of sound. This rocket travels at the unbelievable velocity of approximately 45 miles per minute.

Dr. Jerome C. Hunsaker, chairman of the National Advisory Committee for Aeronautics, recently urged a U.S. Government committee to approve research facilities for guided missiles that will fly at approximately 4,600 m.p.h. (about six times the velocity of sound). Such ultra-high-speed missiles may be propelled by atomic airplane engines, in which a nuclear reactor will replace the fuel-burning combustion chamber now used. —*New York Herald Tribune.*

biology

Plant Speeds Photosynthesis

SCIENTISTS have long sought a plant that would convert sunshine into food more efficiently than the ordinary plant. A strain of the green algae *chlorella* appears to be the answer to the problem. The *chlorella* wastes less sunshine than any other plant, operates at the high temperature of 102.2° F., and, best of all, it produces 100 times its own cell volume of oxygen per hour, compared to the 20 times produced by most of the photosynthetic organisms. This plant was isolated from warm surface waters by Doctors Constantine Sorokin and Jack Myers at the University of Texas, Austin, Texas, and the Carnegie Institution of Washington, Stanford, Calif. Moreover, *chlorella* can operate for sustained periods, an important feature when scientists are searching for a means of increasing the world's food supply (by utilizing algae "farming" for instance), and for an improved way to harness the energy of sunshine. The particular strain of *chlorella* is Tx 71105. Previous experiments had been conducted with *chlorella* grown at lower temperatures (about 77°); it was believed that such one-celled plants could not withstand such high temperatures as 102.2° F. The discovery of the new high-temperature plant, *chlorella*, was described in *Science* magazine. —*Science Service.*

chemistry

Atmosphere's Origin

MILLIONS of years ago, in the great cosmic void, the Earth was formed by the condensation of a gigantic cold cloud of dust and gas. This is the theory of Dr.

Wendell Latimer, professor of chemistry, University of California.

The Earth's atmosphere, which is compatible to life as we know it, probably began as a film of water and steam surrounding our planet. When the cosmic cloud condensed, the original gaseous material was lost. Dr. Latimer's explanation continues with the theory that considerable gravitational energy resulted from the condensation process, causing heat to be developed, when solid particles were condensed. The water in these solid particles was possibly boiled out, the escaping steam carrying away most of the heat.

The Earth's surface presumably cooled rapidly, the water vapor from the steam constituting the first atmosphere. As time passed, the water vapor was decomposed (by ultraviolet radiation) into oxygen and hydrogen. Chemical processes occurring in the Earth's crust gave rise to the carbon-dioxide element.—*University of California Release.*

Solar Chemical "Seesaw"

A NEW CHEMICAL "seesaw," operated by sunlight, comprises simply a container of water into which compounds of the element cerium are dissolved. Two chemical reactions occur due to the direct action of sunlight on the cerous compound in solution, causing the water to be broken up into hydrogen and oxygen. The process was recently described by Doctors Lawrence J. Heidt and Alan F. McMillan, of the Massachusetts Institute of Technology, before a meeting of the American Chemical Society in Los Angeles, Calif. Decomposition of water formerly required a source of direct current such as an electric battery. The new cerium *seesaw* unit employs two compounds, cerous and ceric perchlorates. When sunlight falls on the solution of water and the cerus compound, it absorbs energy from the sunlight to combine with oxygen to become ceric perchlorate and cause hydrogen to be set free.

Simultaneously, under the action of sunlight, ceric perchlorate can be transformed again into the cerous compound, liberating oxygen during the process. Doctors Heidt and McMillan discovered that the two chemical reactions occur at the same time, in the same solution, a most interesting effect; the net result is that water is decomposed into its elements—hydrogen and oxygen—with no activating agent other than sunlight.—*Science Service.*

food chemistry

Cathode Ray Meat Preserver

THE latest method of preserving meat, without the benefit of a deep freeze chest, is irradiation by cathode rays for one second. Hamburgers thus treated can be preserved in a refrigerator for 60 days instead of the usual six. Similar treatment of fresh spinach and pink (nearly ripened) tomatoes will preserve them as well, thanks to research performed by scientists at the Massachusetts Institute of Technology for the U.S. Navy. Danger of spoilage is thus eliminated by irradiation, and the flavor is preserved, too. A promise for the future is the sterilization of food so that it will not spoil, even without refrigeration.—*Science Service.*

electronics

Meteor Trails Reflect Radio Waves

IONIZED trails left by meteors can reflect radio waves and improve radio-communication over long distances. Thousands of tiny meteors act to ionize the outer layers of the Earth's atmosphere and thus provide a reflecting medium for radio waves of certain frequencies. The meteor echoes appear to last longer at lower frequencies (in the region of 15 megacycles) than they do at higher frequencies, according to Dr. O. G. Villard, Jr., of Stanford University, California, who described this latest discovery before a meeting of the Institute of Radio Engineers in New York City. The meteor-ionized upper layers of the atmosphere may double or triple the number of channels available for radio communication over thousand-mile distances.

The use of the ionized upper layers of the atmosphere for reflecting high-frequency radio waves is well known, but with frequencies of 10 to 25 megacycles, relatively low-power (1,000 watts) and simple antennas, radio-echo signals were sent up to the 1,000-mile meteor-ionized layers of the atmosphere, when no reflection of the signals from regular ionospheric layers took place at all.—*Science Service.*

Electric "Divining Rod"

ALTHOUGH formerly the man with the willow-twig claimed he could locate underground water by noting the dipping action of the twig, now an electromagnetic "divining rod," developed by Don Hansen of the Institute of Geophysics (University of California at Los Angeles), has accurately located water in preliminary tests. The new electric device is at least based upon a scientific conception, the principle of ore-prospecting devices, and uses two wire coils to locate the water-bearing strata. The magnetic field of one coil induces an electric current in the ground being searched; the second coil, connected with suitable sensitive indicating instruments, measures differences in the induced current as it flows through the ground.

Various water-bearing strata (such as tightly packed silt and clay or loose sand and gravel) exhibit different degrees of electrical conductivity, and thus permit the observer to identify the various types of strata present underground and simultaneously to determine the possible presence of water. Most interesting, even the quality of water can be indicated. Buried river channels can be located or charted by the instrument.—*University of California Release.*

medicine

Hormones and Growth of Teeth

THE growth and eruption of teeth are caused by two body gland chemicals (the growth hormone secreted by the pituitary gland and thyroxine from the thyroid gland). Tooth growth is dependent on the growth hormone from the pituitary gland, while tooth eruption is activated by the thyroxine. A test was made on an 18-

year-old youth who still had his baby teeth. A dental clinic examination revealed that he had a thyroid deficiency. Thyroid hormone treatment caused his permanent teeth to erupt. The discovery of the effects of these gland chemicals on the teeth was announced recently by Drs. L. J. Baume, H. M. Evans and H. Becks of the University of California, at a meeting of the International Association for Dental Research, at Philadelphia, Pa. Experiments on animals disclosed that, for aiding tooth development, the best combination was growth hormones and thyroid hormones. The growth hormone has not been used in human research thus far. In animal experiments it was found that growth and thyroid hormones administered to rats (previously deprived of their pituitary and thyroid glands) made the deformed, undeveloped teeth grow to normal size. The thyroid hormone causes the embryonic tooth buds to develop and later attain their normal enamel coat. The growth hormone ensures that the tooth pulp, bone, dentine, and other vital parts are properly nurtured.—*Science Service.*

Cadmium in Human Kidneys

SCIENTISTS have discovered high concentrations of cadmium in the human kidneys. Cadmium has a high capture cross-section for slow neutrons with resulting gamma radiation, such as that from radium or atomic bombs.

The measurement of the poisonous metal cadmium in the kidneys of 42 people was recently announced by Doctors I. H. Tipton, W. D. Foland, F. C. Bobb, and W. C. McCorkle, of the University of Tennessee, before a meeting of the American Physical Society. More than one thousand parts per million of cadmium was found in every kidney examined by spectrographic analysis. Smaller quantities of cadmium were also discovered in most samples of liver and pancreas examined, but the tests on all samples of kidney tissue disclosed ten to fifty times as much cadmium present.—*Science Service.*

Atomic Particles and Heredity

THE effect of atomic bomb radiations on heredity carriers in living cells may soon be definitely known. Dr. William Bloom and Prof. Raymond E. Zirkle, of the University of Chicago, recently described results so far obtained by concentrating a beam of nuclear particles (protons) on the microscopic carrier of heredity in living cells. They described their experiments before a meeting of the American Association of Anatomists in Columbus, Ohio. The beam of concentrated protons was obtained from a 2,000,000-volt atom-smasher, the stream of nuclear particles being focused through a super-pinhole in a metal disc, which reduced it to a size of one twelve-thousandth of an inch in diameter. When two or three of the chromosomes, the carrier of the heredity determinants, were subjected to the effects of the nuclear beam, the irradiated chromosomes acted as if glued together. Those which were not irradiated turned about the glued ones as though attached by an invisible thread, instead of moving straight apart in the normal manner. At times a bridge of chromosomes remained between two new daughter cells, the nuclei rushing back and forth between the newly formed cells. As the dosage of nuclear particles was varied, different effects on the process of cell division occurred.—*Science Service.*

Control of Earth's Climate

IF MAN ever controls the climate of the Earth, it will possibly be accomplished by the aid of a man-made satellite, according to Dr. Heinz Haber, University of California (at Los Angeles) scientist, who describes such phenomena in his new book, *Man in Space*.

Dr. Haber envisions the conquest of space as a project worth while mainly in terms of man's effort to conclude the conquest of his own planet, particularly the control of the Earth's climate. He expresses the opinion that man would gain but little by flying to other planets, except for collecting historical or scientific

fact data. Man may solve the engineering problems presented by interstellar flights, but the real limit is man himself!

The conquest of space will depend primarily on man's ability to overcome the physiological problems to be met with in navigating space—such as the problems of oxygen supply, weightlessness, extreme heat, and cosmic radiations.—University of California Release.

Colder Weather Foretold by Ocean Mud

THE WEATHER will be colder in the next hundred years! Dr. J. D. H. Wiseman, of the British Museum of Natural History, bases his estimate of the world's future weather on information gleaned from a study of cores of mud obtained from the ocean beds. Cyclic fluctuations in our

planet's temperature are recorded in the sediment on the ocean beds and by studying their rhythm, it has become possible to predict that in the next one or two hundred years the Earth's climate will grow steadily colder.

The oceanbed sediment contains varying amounts of tiny sea-shells, fossil remains of the foraminifera (tiny one-celled animals) that live largely on the ocean's surface. When they die, the shells sink to the ocean's floor. In periods of warm weather the foraminifera flourish and in colder weather they are scarcer. A study of the layers of sediment shows the rise and fall of temperature in past periods, judged by the fluctuation in the amount of foraminifera shells present. This data, coupled to that on recent and remote historical and geographical periods permits the chronological charting of the changes in the Earth's climate.—Science Service.

Science Questions and Answers

Disappearing Days

Editor:

Some say the moon rotates once in every 27 days. Others say 29 days. Which is correct?

K. Nordberg
Clearwater, Florida

Answer:

Both. It depends on how you look at it. If you were out in space a revolution of the planet would be completed when the moon reaches a point nearest another marker in space. Let us say you are lining it up with proximity to Alpha Centauri, 4.3 light years away from us. (A light year is roughly 9½ million million kilometers.) The complete revolution would be once every 27.32 days. But to an observer on Earth the same phase of the moon is not yet repeated. Both Earth and moon have moved in their orbits around the sun. It takes 29.53 days for you to see the complete revolution of the moon, that is, to see exactly the same face you saw before. This is called the *synodic period*.

If this still puzzles you, place two identical coins on the table. If they are new the milled edges will give you gear-like teeth and lessen slippage. Hold one coin firmly and rotate the other around it. The marking on the face of the rotating coin will be right side up twice during one complete revolution. But if you imagine you are sitting on the center of the stationary coin, there will appear to be only one revolution. With proper gear ratios on an errory the same face can be made to always appear to you who observe the moon from a position on Earth, but you can see the moon rotate from your "space" position.—Editor.

Space Ship Problems

Editor:

Would a person in a spaceship know which side is up? Would he find himself floating from one side of the cabin to the other? Because he will get no assist from gravity, wouldn't he find it difficult to eat or drink? Wouldn't his blood boil because of the reduced pressure?

Harold Stark
Bermuda

Answer:

In space there is no such thing as up and down. A spaceship can always set its nose toward a distant planet, star, or use the Earth as a reference point. Yet you can tell if you are up or down without using your eyes. You do not require a reference point. It seems that the semicircular canals in the ears in some manner set your equilibrium. Disturbance in the canals will cause a change in the position you assume. Mental and physical disturbances also can produce similar effects. It has been demonstrated that if the semicircular canals are destroyed in experimental birds, the bird no longer is able to fly upright but spirals through the air. Animals also lose their ability to stay upright when the semicircular canals are damaged.

However, a space traveler likely would operate in a pressurized cabin. Under such conditions his equilibrium would remain unchanged if he did not let his vision "correct" his state. Often similar corrections are made right here on Earth, for example, in the amusement-producing Topsy Turvy House and on airplane flights without instruments, when consideration is given to an apparent horizon which may be the sloping side of a mountain. Whether or not gravity plays an important rôle in the operation of the nervous impulses from the canal is another matter demanding considerable study. Apparently it has an effect, as any seasick traveler has known by experience. Yet, drivers of high-speed cars on small circular tracks have been able to overcome the modification produced by great changes in gravities merely by rolling their heads, thus to equalize the ear effects.

Bodies are attracted to each other directly as their masses and indirectly as the square of the distance between them. As the mass of a spaceship may be 500 times that of a man there would be some attraction between the two even in free flight. The direction of greatest influence might depend on the relationship of distribution of the masses. If the man were in the exact center of the mass, the attraction would be quite equal in all directions. Another factor to be considered is the acceleration or deceleration of the

ship, which may have some bearing on the person's ability to get around. If the ship is moving faster than the man he may find it impossible to rise from his seat. Newton's first law of motion applies: Every body continues in its state of rest or of uniform motion in a straight line unless impelled by some external force.

There should be no problem in the act of eating or drinking. You can eat or drink while standing on your head. Musculature responsible for swallowing will convey food or drink to the stomach; there other muscles take over.

Long before the blood reaches the boiling point (if he were in a vacuum) the person would be dead from many explosive ruptures in viscera, blood vessels, and body cavities.—Editor.

Hydrogen—Building Stone of Matter

Editor:

Is it possible that hydrogen could be the building stone of the atoms of all the elements? The atomic weight for hydrogen is 1. Four of these hydrogens would make helium, twelve would give us carbon, fourteen would make nitrogen, sixteen would produce oxygen, etc. No?

J. Arico
San José, California

Answer:

This thought has been postulated many times before, but falls down completely when accurate measurements are used.

The Committee on Atomic Weights has adopted internationally the following: For hydrogen, 1.0080; helium, 4.003; carbon, 12.01; oxygen, 16.000. With some elements the application of the theory is even much farther afield; thus, you could not divide the atomic weight of hydrogen, 1.0080, into the following and come out even: fluorine, 19.000; chlorine, 35.457; argon, 39.944; etc.

It is perfectly possible, of course, that the presence of isotopes of the elements would supply a reason for nonconformity to the hypothesis in some cases. There are experiments to suggest that this may be so. For example, chlorine has two isotopes, ^{35}Cl and ^{37}Cl , found in Nature in the ratio of about 3 to 1 to give an average mass of 35.457.—Editor.



"THE WAR OF THE WORLDS"

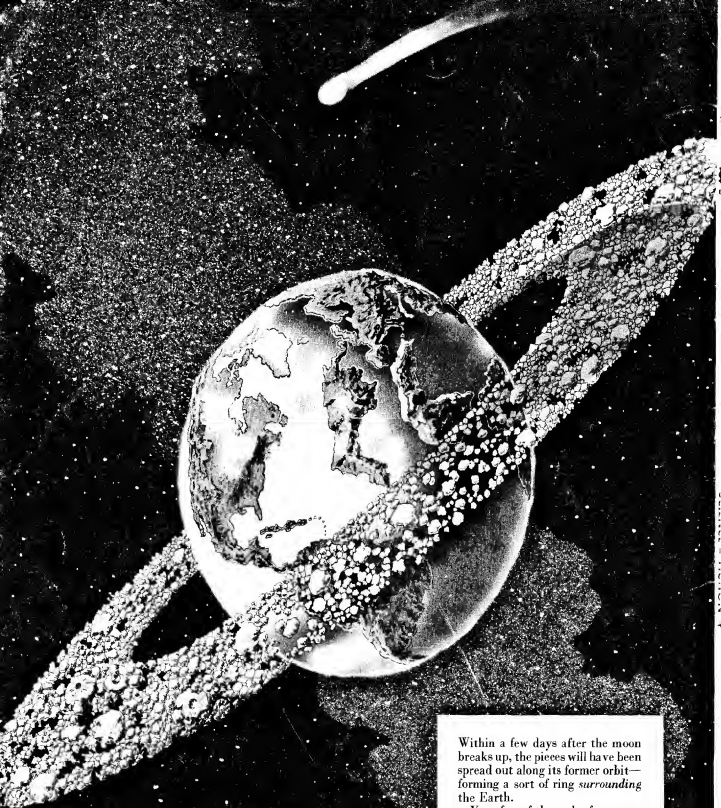
Motion Picture Production Corporation

The late H. P. Lovecraft, in his excellent essay, *Some Notes On Interplanetary Fiction*, once wrote: "The true 'hero' of a marvel tale is not any human being, but simply a *set of phenomena*." George Pal, famed producer of *Destination Moon* and *When Worlds Collide*, echoes this sentiment when he states that "the special effects" are also the stars of his films.

Nowhere is this viewpoint more strikingly borne out than in his new production, *The War of the Worlds*. The tremendous pyrotechnics of this film add incalculably to its over-all impact. For the first time, force screens are depicted on the screen. Also present are anti-gravity ships with realistic heat rays. The moviegoer is carried from one marvel to the next. The slight attempts at love interest are merely irksome interludes and one is happy to find a convincingly contrived, truly alien-looking Martian interrupting such frivolity. The destruction of Los Angeles is most impressive.

Though some modifications were necessary to modernize this Wells story, the final result was excellent. The black and white reproduction of the stills does the film an injustice. For true impact, they should be seen in full color. There is no question that *The War of the Worlds* is a landmark in the production of science-fiction films.





Within a few days after the moon breaks up, the pieces will have been spread out along its former orbit—forming a sort of ring surrounding the Earth.

Very few of the rocky fragments will fall in toward the Earth. Most of them will swing in roughly circular paths about the center of the Earth, occasionally colliding with one another, causing further fragmentation until a narrow ring results, closely resembling that surrounding the planet Saturn.

The ring stage of the Earth-moon system makes for diffuse, almost shadowless moonlight—actually "ringlight"—every night, and peculiar, partial eclipses of the sun when the sun crosses the ring in the sky, but reflecting brightly from the rest of the ring. See *The End of the Moon* in this issue.